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Five-Year Review Report

Second Five-Year Review Report
for
Big D Campground Site
City of Kingsville
Ashtabula County, Ohio

September 2004

PREPARED BY:

Ohio Environmental Protection Agency
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Written by: _____ Date: 8/19/04
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U.S. EPA, Region 5

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List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	Environmental Protection Agency
ESD	Explanation of Significant Difference
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SVOC	Semi-Volatile Organic Compound
SDWA	Safe Drinking Water Act
USACE	United States Army Corp of Engineers
VOC	Volatile Organic Compound

Executive Summary

The remedy for the past five years for the Big D Campground site (the Site) in Kingsville, Ashtabula County, Ohio, included discontinuance of the ground water extraction and treatment system, and monitored natural attenuation. The trigger for this Five-Year Review was the signature date (September 30, 1999) on the last Five-Year Review.

The assessment of this Five-Year Review found that the remedy was constructed in accordance with the requirements of the Record of Decision (ROD). U.S. EPA approved to discontinue on-site treatment of ground water and proceed with a 2-year revised Monitored Natural Attenuation (MNA) pilot study. The MNA study was extended for 2 additional years to include more sampling data to determine the effectiveness of natural attenuation occurring in the aquifer. U.S. EPA and Ohio EPA have reviewed the current MNA data available. U.S. EPA and Ohio EPA have agreed that the data collected from the final two sampling events will be evaluated prior to making any recommendations of the effectiveness of MNA at the site. Also, an additional possible pathway has been located at the Site: human exposure to indoor air from ground water. This pathway will be evaluated to determine if the remedy is protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name : Big D Campground		
U.S. EPA ID : OHD980611735		
OHIO EPA ID: 204-0098		
Region: 5	**State:** Ohio	**City/County:** Kingsville/Ashtabula
SITE STATUS		
DNPL Status: _X_ Final ___ Deleted ___ Other (specify)		
Remediation Status: (choose all that apply): ___ Under Construction ___ Operating _X_ Complete		
Mutiple OUs?* ___ Yes _X_ No	**Construction Completion Date:** 5/9/1995	
Has site been put into reuse? ___ Yes _X_ No		
REVIEW STATUS		
Lead Agency: ___ U.S. EPA _X_ State ___ Tribe ___ Other Federal Agency		
Author Name: Andrew C. Kocher		
Author Title: Site Coordinator	**Author Affiliation:** Ohio EPA / Northeast District Office	
Review Period:** 2/1/04 to 9/30/04		
Date(s) of Site Inspection: 4/27/04, 6/2/04		
Type of Review: _X_ Post-SARA ___ Pre-SARA ___ NPL-Removal Only ___ Non-NPL Remedial Action Site ___ NPL State/Tribe-lead ___ Regional Discretion		
Review Number: ___ 1 (first) _X_ 2 (second) ___ 3 (third) ___ Other (specify)		
Triggering Action: ___ Actual RA On-Site Construction OU # ___ ___ Actual RA Start at OU # ___ ___ Construction Completion _X_ Previous Five-Year Review Report ___ Other (specify)		
Triggering Action Date: 9/30/1999		
Due Date (five years after triggering action date): 9/30/2004		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Issues:

An additional possible exposure pathway for residential human targets has been located for inhalation of indoor air.

Natural attenuation is currently being evaluated at this site.

Recommendations and Follow-up Actions:

Conduct a detailed site-specific risk assessment of the indoor air exposure pathway. Potentially conduct sub-slab sampling, indoor air sampling, soil gas sampling, and install indoor air scrubbers in the homes above the contaminate plume.

Conduct final MNA sampling event in September/October and PRP to provide a detailed report of the MNA Demonstration Project for U.S. EPA and Ohio EPA review.

Protectiveness Statement:

A protectiveness determination of the remedy at Big D Campground cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions: evaluating the results of the MNA Study and performing a detailed Risk Assessment concerning potential indoor air issues. It is expected that these actions will take approximately six to nine months to complete, at which time a protectiveness determination will be made. All immediate threats at the Site have been addressed.

Long-term Protectiveness:

Current monitoring data indicate that concentrations of contaminants in the plume may be unstable; however, all data has not been collected and a final evaluation of MNA has not been performed. After an evaluation of all MNA data, a decision will be made to continue ground water collection/treatment or continue MNA at the Site.

Other Comments:

All current monitoring data indicate that the plume remains on the deed restricted property.

Big D Campground Site
Kingsville, Ashtabula County, Ohio
Second Five-Year Review Report

I. Introduction

The Ohio Environmental Protection Agency (Ohio EPA) has conducted a Five-Year Review for the United States Environmental Protection Agency (U.S. EPA) at the Big D Campground site (the Site), Ashtabula, Ohio. The purpose of the Five-Year Review is to ensure that the remedial action implemented at the Site remains protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

Ohio EPA is preparing this Five-Year Review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA § 121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with Section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The U.S. EPA interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Ohio EPA conducted the Five-Year Review of the remedy implemented at the Site in Kingsville, Ashtabula County, Ohio. This review was conducted by Ohio EPA's Site Coordinator and reviewed by the U.S. EPA Remedial Project Manager (RPM) for the entire Site from February 2004 through September 2004. This report documents the results of the review.

This is the second Five-Year Review for the Big D Campground site. The triggering action for this statutory review is the signature date of the first Five-Year Review on September 30, 1999. The Site's Record of Decision (ROD) was signed in 1989, which categorizes the Site as post-SARA; therefore, the first Five-Year Review was conducted as a matter of statute. The Five-Year Review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1 - Chronology of Site Events

Event	Date
Dumping of waste products.	1964 to 1976
Preliminary investigations and PRPs were sent information of the investigation.	1982
Site proposed for NPL.	12/82
Site became final on the NPL.	9/8/83
Notice letters sent to PRPs.	4/85
Notice and draft of SOW for RI/FS sent to PRPs.	11/85
Negotiations to conduct RI/FS sent to PRPs.	12/85
Agreement met that Olin was to conduct RI/FS.	2/15/86
RI began.	1986
RI completed.	1988
Final RI/FS and Proposed Plan were released for public comment.	7/28/89
ROD signed for source excavation and incineration, public meeting held.	1989
Public comment period ended.	8/26/89
Special notice sent for RD/RA negotiations issued to PRPs.	9/30/89
ESD signed modifying the pump and treatment system	5/5/93
Excavation completed.	10/8/93
Remedial design completed.	3/25/94
Remedial Action started.	5/11/94
Remedial Action completed.	3/30/95
Preliminary Close-out Report completed.	5/9/95
First Five-Year Review completed.	9/30/99
Revised Proposal for Monitored Natural Attenuation (MNA) began.	11/24/99
Revised Proposal for Monitored Natural Attenuation extension granted.	4/25/02

III. Background

Physical Characteristics

The Big D Campground site is located in Kingsville, Ashtabula County, Ohio, approximately 2.5 miles south of Lake Erie and 50 miles northeast of Cleveland, Ohio. The Site is located south of Creek Road, north of Conneaut Creek, and west of and adjacent to the former Big D Campground. The capped landfill at the Site is approximately 1.2-acres in size and approximately 20 feet deep. The landfill is located on the southern side of the Site. The land slopes sharply towards Conneaut Creek (approximately 32% slope) approximately 50 feet to the south of the southern edge of the landfill.

The Site is bordered by Conneaut Creek to the south, a former campground to the southwest, open land to the west, and residences to the north and northwest. The residences are located approximately 500 feet north of the Site. It should be noted the Olin Corporation (Olin) has acquired the ground water rights of the surrounding property owners. Additionally, Olin has placed deed restrictions on these off-site properties to prohibit the use of ground water both currently and in the future. Notice letters were sent to three PRPs: Olin Chemicals Corporation, Brenkus Construction Company, and Mr. Dreslinski. Olin was sent a CERCLA Section 104(e) information request at approximately the same time, to which they responded in July 1985.

The fund-financed Remedial Investigation (RI) began in late 1986 and was completed in mid -1988. The final RI/FS and Proposed Plan were released for public comment on July 28, 1989. A public meeting to discuss these documents was held on August 8, 1989. The public comment period ended on August 26, 1989.

Land and Resource Use

The Big D Campground site was initially operated as a sand and gravel quarry. Between 1964 and 1976 (during the time the quarry was in operation), approximately 2.8 acres of the Site were operated as a landfill and accepted hazardous and non-hazardous materials.

The current land use for the surrounding area is residential and recreational. Conneaut Creek is used for fishing and swimming. It is anticipated that these land uses will continue into the future. A portion of the Site is currently fenced and the incinerated waste and soils are contained within the fenced area under a landfill cap.

The ground water aquifer at the Site is currently not used as a drinking water source. Olin has purchased the water rights and has prohibited its use at the Site and at the adjacent properties. The dominant ground water flow direction is to the north away from Conneaut Creek.

History of Contamination

Known hazardous wastes disposed in the landfill at the Site included residues from toluene diisocyanate production (K027), toluene diisocyanate (U223), chlorobenzene (U037), and diaminotoluene (U221). In addition to the known hazardous wastes, other wastes of undocumented type and quantity were disposed of in the landfill. Available information suggests that these wastes included drummed halogenated and non-halogenated solvents, caustics, and oily substances. The following materials are believed to have been transported to the Site for disposal:

- Spent vacuum pump oil potentially containing toluene diisocyanate (TDI), monochlorobenzene (MCB), and trace phosgene.
- TDI residue containing MCB
- Diaminotoluene (DAT) and TDI-impacted soils
- Fly ash
- Trash (Sanitary Waste)
- Monoethanolamine (MEA)
- Off-specification TDI
- TDI and DAT in sample cans and bottles.

Site investigations conducted between 1982 and 1988, identified drums containing halogenated and non-halogenated solvents; caustic; and oily wastes; bulk toluene disocyanate (TDI); TDI residue contaminated with monochlorobenzene and carbon tetrachloride; monoethylamine; and soils contaminated with many of the above. The initial estimate of volume of hazardous materials was 28,000 cubic yards. Ground water was found to be contaminated with volatile organic compounds (VOCs) and heavy metals including barium, chromium, and lead.

Initial Response

Preliminary investigations began at the Site in 1982. As early as 1982, the major Potentially Responsibly Party (PRP) at the Site was sent information on these investigations. In December 1982, the Site was proposed for the National Priorities List (NPL). On September 8, 1983, the Site became final on the NPL. In that same year, Olin constructed a clay cap over the landfill. In April 1985, notice letters were sent to three PRPs: Olin Chemicals Corporation, Brenkus Construction Company, and Mr. Dreslinski. Olin was sent a CERCLA Section 104(e) information request at approximately the same time, to which they responded in July 1985. The fund-financed RI began in late 1986 and was completed in mid -1988. The final RI/FS and Proposed Plan were released for public comment on July 28, 1989.

The RI concluded that the waste buried in the landfill had caused soil and ground water contamination. The extent of ground water/soil contamination presented in the RI was based on information collected from nine well clusters (MW01 through MW09) with deep and shallow monitoring wells and their respective soil borings, six off-site residential wells, a soil gas survey, and ground water modeling. As a result of the investigations, the U.S. EPA issued a Record of Decision (ROD) in 1989 specifically addressing contaminated soil and ground water.

Basis for Taking Action

Contaminants:

In all, there were 25 contaminants identified in the source area, soil, ground water, and surface water; however, not all contaminants were identified at all locations or in all media. Of the 25 contaminants, 13 were determined to be indicator chemicals. As stated in the ROD, these indicator chemicals were chosen based on factors such as number of times a chemical was detected, the maximum concentration, and persistence and toxicity to human health and the environment. Of the 13 indicator chemicals, five are metal elements and eight are organic compounds.

Metals	Organic Compounds	
Barium	2,4-Diaminotoluene (DAT)	Tetrachloroethene (PCE)
Beryllium	1,2-Dichlorobenzene (*o*-DCB)	Trichloroethene (TCE)
Chromium	1,4-Dichlorobenzene (*p*-DCB)	Vinyl Chloride (VC)
Lead	*trans*-1,2-Dichloroethene (*trans*-DCE)	Chlorobenzene (MCB) (aka, Monochlorobenzene)
Nickel		

The first Five-Year Review report dated March 1999 provides a detailed discussion of metals detected at the Site. U.S. EPA recommended in the first Five-Year Review to remove metals from the monitoring program. Interim approval to remove metals was granted by U.S. EPA, by approving the revised proposal for MNA.

Organic compounds were detected in shallow wells screened in the water table aquifer, deep wells screened in the confined bedrock aquifer, and in wells along Conneaut Creek screened in the alluvial overbank and semi-confined bedrock aquifers. During the RI, organic compounds were detected in samples from deep wells screened in the confined bedrock aquifer. (Subsequent investigation during the Supplementary Data Collection Program (SDCP) showed no contamination of the confined bedrock aquifer.) No organic compounds attributable to Site activities were detected in the off-site residential wells sampled (U.S. EPA, 1989). Surface water samples from Conneaut Creek indicated that no chemicals of concern (COCs) were present at action levels. Chlorobenzene was the only organic compound detected in surface water samples from Conneaut Creek; however, all detections were below action levels. No sediment contamination attributable to Site activities was detected.

According to a letter from the PRP titled *Requested Information, MNA Demonstration Program Data*, dated June 4, 2004, a few of the COC's (2,4-Diaminotoluene (DAT), 1,2-Dichlorobenzene, 1,4-Dichlorobenzene) were removed from the sampling parameters during the demonstration period. The removal of 1,2-Dichlorobenzene, 1,4-Dichlorobenzene, and DAT from the analyzes was approved by U.S. EPA in the interim, as a part of the revised proposal for MNA. However, samples for DAT were collected from the overbank and semi-confined aquifers near the creek (MW-7SR, MW-7DR, MW-52D, MW-53S, MW-53D), from the shallow aquifer (MW-17S and MW-18S), and from surface water samples in 2000 and 2001. All of the results for DAT were below 50 ug/l or not analyzed due to the fact that the wells were dry.

IV Remedial Actions

Remedy Selection

The ROD identified three main remedial requirements: 1) source area excavation and incineration followed by placement and backfilling of the ash, 2) ground water collection and treatment, and 3) ground water monitoring (i.e. long-term performance monitoring). Prior to implementing the designated remedial alternative, Olin conducted a Supplemental Data Collection Program (SDCP) as specified in the ROD. The SDCP was conducted from 1991 to 1992 and results were reported to U.S. EPA in Olin's September 1991 Phase I Report and March 1992 Phase II Report. As part of the SDCP, new monitoring wells (MW12 through MW53) were installed to better determine the extent of ground water contamination. The SDCP concluded that MCB, PCE, TCE, DCE, and VC were the primary contaminants present in the ground water; all other contaminants were detected only in isolated locations and did not appear to be migrating significantly. In addition, the primary aquifer unit of concern is the water table aquifer and the contamination migrating north from the former landfill.

Ground water clean-up standards for the Site were specified in the ROD and the Administrative Order (AO). They were based on a future use scenario such that the ground water should 1) not exceed maximum contaminant levels (MCLs) established by U.S. EPA and 2) reduce risks posed from ingesting ground water to a cumulative Hazard Index of 1 or less and a cumulative cancer risk of 10^{-6} or less. Table 5 in the ROD lists the risk-based clean-up goals for constituents at the Site. Table 5 in the ROD also lists the constituents that are monitored as part of the long-term performance monitoring of the existing ground water collection and treatment system. Table 1-1 lists the organic indicator chemicals included in the long-term performance monitoring program. Note that not all indicator chemicals are included as part of this program. Table 1-2 lists the remedy clean-up goals for organic indicator chemicals. Both the MCL and risk based clean-up goals are listed.

In addition to the previously mentioned ROD requirements, the ground-water treatment alternative prescribed that:

- Ground water from the water table aquifer would be collected using two interceptor trenches.
- Ground water from the alluvial overbank aquifer, the semi-confined bedrock aquifer, and confined bedrock aquifer would be collected with extraction wells.
- Collected ground water from the trenches and wells was to be treated on-site with a granular activated carbon (GAC) system and then discharged to Conneaut Creek.

During implementation of the remedy the ground water treatment at the Site was modified from the original alternative prescribed in the ROD:

- The use of active ground water pumping by extraction wells in the water table aquifer, and an approximate 500-foot long artificial recharge trench.

- The passive collection of water from the alluvial overbank aquifer and semi-confined bedrock aquifer from a 600-foot trench.

- The sampling of the confined bedrock aquifer on an annual basis.

Remedy Implementation

The following paragraphs discuss the implementation of each aspect of the remedial action.

1. RD/RA Work Plan: A Work Plan, developed in accordance with the ROD, addressed all activities to be completed as part of the Site Remedial Design/Remedial Action (RD/RA), including implementation of the Supplemental Data Collection Program (SDCP).

2. Fencing: Throughout operations, fencing was maintained around the remedial activities. The final fencing encloses the former landfill and the ground water treatment facility.

3. Deed Restrictions: A survey plat ("Survey of Ground-water Remediation Facilities") was created to reference permanent benchmarks, all deed and use restrictions of the property, and the location and dimensions of the disposal area, collection trenches, extraction wells, and ground water treatment system.

4. Source Area Excavation: A total of 93,219 tons of materials were excavated and incinerated from the former landfill. This resulted in an excavated area of approximately 2.7 acres with nominal dimensions of 230 feet wide by 510 feet long and 18 feet deep. The completed excavation was surveyed prior to backfill on October 8, 1993.

   Confirmation soil samples were collected and analyzed for tetrachloroethene, monochlorobenzene, 1,2-dichlorobenzene, and 1,4-dichlorobenzene. The results and conclusions of the sampling were presented in a letter to U.S. EPA dated May 1994.

5. On-Site Incineration: The incinerator trial burn was conducted from September 24 through 28, 1992, at which time interim burn approval was received from the U.S. EPA. Interim burn continued until February 1993 when approval of the Trial Burn Report was received from U.S. EPA, after which full production burn commenced. During the trial burn, ash was tested in accordance with the Confirmation of Incinerator Ash Delistability Plan. The combination of the trial burn exercise and the periodic sample analysis of the ash as required in the Incinerator Ash Delistability Plan confirmed that the ash was delistable. Consequently, U.S. EPA allowed the placement of the ash back in the landfill. Wastes excavated from the former landfill were incinerated and the ash was sampled prior to backfill. Results were reported periodically throughout operations.

   The Remedial Action Implementation Report was submitted to the U.S. EPA in February 1995. In a letter dated March 30, 1995, the U.S. EPA approved the Remedial Action Implementation Report signifying that remedial action was complete for the on-site incineration portion of the remedy.

6. On-Site Material Disposal and Backfilling: The excavated area was backfilled with ash and

covered with clean fill, topsoil, and vegetated cover. Incinerated materials were sampled prior to backfill and determined to be delistable.

7. Water Table Aquifer Ground Water Collection System: The remedy specified in the ROD for the water table aquifer consisted of two interceptor trenches; one at the downgradient edge of the contaminant plume and one at the north end of the source area. Ground water monitoring wells were to be installed north of each interceptor trench to monitor for any contamination bypassing the trenches. However, subsequent information derived from the Supplemental Data Collection Program (SDCP) was used with the Geohydrologic Model to design a modified ground water extraction system. Specifically, a well field, supplemented by a potable water recharge system at the northern edge of the landfill, was designed in the water table aquifer. This design change was submitted and approved by the U.S. EPA and Ohio EPA in the Explanation of Significant Differences for Remedial Action at the Big D Campground site, dated May 1993 (ESD).

   Eight extraction wells were installed within nine feet of the original design locations as described in the Final Design Documents. Ten monitoring wells installed during the SDCP were selected as perimeter monitoring wells to be sampled quarterly to demonstrate that no contamination has migrated beyond the perimeter delineated by these monitoring wells.

   Nine piezometers were added to the network of existing wells to provide ground-water elevation data. The potable water recharge system, supplied by city water, was installed at the north side of the excavation. Water level electrodes in Piezometer PZ10 (which is located central to the recharge system) control the water level within the potable water recharge system.

8. Alluvial Overbank Aquifer and Semi-Confined Bedrock Aquifer Ground Water Collection System: The ROD specified remedy for the alluvial overbank and semi-confined bedrock aquifers consisted of using extraction wells to recover ground water. However, subsequent information derived from the SDCP was used to design the current ground water extraction system. An interceptor trench approximately 710 feet long was installed adjacent to Conneaut Creek. Water accumulating in the trench is extracted by Wet Well 01 (WW01). Three nested monitoring well pairs (one each completed in the alluvial overbank aquifer and the semi-confined bedrock aquifer) were installed downgradient of the interceptor trench to monitor ground water as described in the ESD dated May 1993.

9. Confined Bedrock Aquifer Ground Water Collection System: The selected remedy consisted of using extraction wells to collect contaminated ground water from the confined bedrock aquifer. However, analytical data collected during the SDCP demonstrated that no site-related contamination was present in the confined bedrock aquifer. Therefore, no extraction system was needed in the confined bedrock aquifer. This design change was submitted and approved by the U.S. EPA and Ohio EPA in the ESD dated May 1993.

10. On-Site Ground-Water Treatment: Ground water is processed through the existing treatment plant and the effluent sampled in accordance with the final design. A treatability study was performed to demonstrate regulatory and statutory compliance prior to design of the ground water treatment plant. The initial treatment system consisted of metals removal, air stripping, and GAC polish treatment. A letter from the U.S. EPA, dated November 20,

1997, approved modifying the system to exclude the metals treatment portion.

11. Treated Ground Water Discharge to Conneaut Creek: An 8-inch polyvinyl chloride pipe conveys treated water to a discharge point north of Conneaut Creek, from which water drains into the creek. All water discharged from the water treatment plant to date has complied with all applicable requirements.

12. Ground Water and Surface Water Monitoring: Ten perimeter wells located downgradient of the contaminant plume are sampled quarterly to determine the effectiveness of the ground water collection system in the water table aquifer. Three pairs of nested wells down-gradient from the interceptor trench, one each in the alluvial overbank aquifer and semi-confined bedrock aquifer, are sampled quarterly to monitor the effectiveness of the trench. Nine deep bedrock wells are sampled annually to document the water quality in the confined bedrock aquifer. Semi-annual surface water monitoring was implemented in three locations, one upstream, one downstream, and one adjacent to the Site.

    Since 1995, organic contaminants have been detected at concentrations above their respective cleanup goals in samples collected from the water table, alluvial overbank, and semi-confined bedrock aquifers only. Metals have not been sampled since the approval of the revised proposal for MNA. Since September of 1997, ground water sampling has been performed using low flow sampling techniques. This sampling method was approved by U.S. EPA through acceptance of Quality Assurance Project Plan (QAPP) revisions, submitted October 20, 1997.

System Operation/Operation and Maintenance

Early discussions with U.S. EPA in 1996 resulted in a re-evaluation of the selected remedial alternative at this site. There has been a great deal of advancement in the understanding of appropriate remedial technologies for contaminated ground water since the ROD was signed in 1989. One of the remedial alternatives is monitored natural attenuation.

Between June 1996 and March 1997, Olin conducted an investigation to evaluate alternate remedies at the Site including collecting data to evaluate monitored natural attenuation. The U.S. EPA's "Draft Interim Final OSWER Monitored Natural Attenuation Policy" (OSWER Directive 9200.4-17 dated November 18, 1997) was used as guidance to supplement this effort. A work plan dated June 26, 1996 outlining the tasks to be performed in order to evaluate an alternative remedy was provided to U.S. EPA prior to beginning work at the Site. At the time, U.S. EPA provided verbal communication accepting the concept of identifying a more appropriate remedy. Consequently, a proposal was submitted to U.S. EPA in October 1999 suggesting a "Demonstration Project" to evaluate MNA as an appropriate alternate remedy.

Other Operation and Maintenance Activities included maintenance of the installed cap (e.g., groundhog holes, landscaping, etc.), leachate control, if necessary, WWTP, and site security (e.g., site inspections, fencing repair, etc.).

V. Progress Since the Last Five-Year Review

A proposal was submitted to U.S. EPA in October 1999 suggesting a "Demonstration Project" to evaluate MNA as an appropriate alternate remedy. The proposal was accepted on November 24, 1999 and the existing pump and treatment system was shut down in February 2000. The collection of ground water data, specifically aimed at evaluation MNA, started in the spring of 2000 and continued through 2001. Samples were collected from 18 monitoring wells and analyzed for VOCs and geochemical natural attenuation parameters. The purpose of collecting the four rounds of data over the two year period was to demonstrate that risk to human health and the environment would remain at acceptable levels under natural attenuation conditions. Twice a year sampling continued in 2002, and in April 2002, a "Monitored Natural Demonstration Report" was submitted to the Agencies. Ohio EPA submitted comments to the PRP Group which is documented in a letter dated June, 26, 2002. Olin continued to collect MNA monitoring well sampling data to further evaluate whether the (1) COC plumes remained stable in aerial extent and have remained within deed restricted properties, (2) results for the demonstration program are consistent with the modeling predictions, (3) evidence collected during the demonstration program supports ongoing MNA.

On April 28, 2004, U.S. EPA and Ohio EPA representatives attended a meeting with Olin and their consultant and were presented the additional MNA data collected during the extended MNA pilot study. Subsequently, U.S. EPA and Ohio EPA reviewed all available MNA data to determine whether natural attenuation is an appropriate alternate remedy and that it will reduce the concentrations of COC's in ground water to cleanup goals in a time frame comparable to the pump and treat system. Contaminate plume maps and line graphs showing concentrations for selected monitoring wells can be viewed in Attachment A. After review of the current data (up to August 2003), U.S. EPA and Ohio EPA have agreed that the data collected from the final two sampling events will be evaluated prior to making any recommendations.

VI. Five-Year Review Process

Administration Components

The Five-Year Review team was led by the State and the U.S. EPA was tasked as the support agency. Andrew Kocher, Site Coordinator for Ohio EPA, conducted the draft report generation as the representative for the lead agency. Howard Caine of the U.S. EPA, Remedial Project Manager (RPM) for the Big D Campground site, and members from the Regional Technical Advisory staff have been tasked to conduct a review and concurrence of the Five-Year Review. Members of the PRP Group, Olin, Inc., were notified of the Five-Year Review in February 2004.

From February 1 to May 31, 2004, the lead agency completed the following activities:

- Community Involvement
- Document Review
- Data Review
- Site Inspection

- Local Interviews

- Five-Year Review Report Development and Review.

From July 1 to August 31, 2004, U.S. EPA and their review team reviewed the draft report and submitted comments to the lead agency. The comments were addressed immediately following, and a revised report was reviewed and signed by the director of the Superfund Division.

Community Involvement

Activities to involve the community in the Five-Year Review process were initiated with a Public Notice being sent to a local newspaper on February 4, 2004. In addition, a site visit was conducted in April, when Ohio EPA and U.S. EPA conducted home interviews with the surrounding community residents. A questionnaire was given to each homeowner with contact numbers and address. Comments were accepted during the month of May.

During the comment period, a local resident expressed concern that the property is not mowed frequently enough. None of the residents expressed any concerns over the protectiveness of the remedy.

On approximately September 30, 2004, results of the review and the report were available to the public at the Kingsville Library and Ohio EPA's Northeast District office.

Document Review

This Five-Year Review consisted of a review of relevant documents including O&M records and monitoring data. A major portion of these documents consisted of the recent MNA Demonstration documents.

Data Review

Ground Water Monitoring

The initial two-year revised proposal for MNA was approved on November 24, 1999. The first of four biannual monitoring well sampling events began in March, 2000. During these sampling events, 18 monitoring wells were sampled for VOCs and eight of these wells were sampled for MNA parameters. The monitoring continued after the initial two years due to a lack of data. An additional three sampling events were conducted in order to support the initial data collected during the pilot study. The monitoring included the collection of ground water elevations (see Table 3) and the collection of ground water samples for laboratory analysis. Sampling was conducted to monitor the concentrations of selected COCs after shutting down the ground water treatment plant, and evaluate the potential of natural attenuation. Volatile organic compounds (VOCs) were analyzed in each monitoring well and results are shown in Table 3 for the selected COCs detected.

In addition to looking for contaminants, samples were tested for parameters in the field. These field parameters include: pH, temperature, specific conductance, dissolved oxygen, oxidation reduction potential (ORP), turbidity, and iron(II). Table 3-2 shows all field parameter results for all sampling

events.

During the initial two-year study, Olin sampled a sub-set of eight monitoring wells to be analyzed for Geochemical Natural Attenuation Parameters, which included: dissolved organic carbon (DOC), chloride, nitrate, sulfate, alkalinity, sulfide, carbon dioxide, methane, oxygen, and ethene. After the initial two-year study and one additional sampling event, Olin began to sample all 18 wells for these parameters including hydrogen which was added and analyzed in a few of the wells. Additionally, DOC analysis was changed to total organic carbon (TOC). Table 3 shows all of the analytical results for the Geochemical Natural Attenuation Parameters for the last two most recent sampling events.

Private Drinking Water Monitoring

No drinking water wells were sampled. All residents within the deed restricted property are currently being supplied water (See Attachment E).

Site Inspection

Inspections at the Site were conducted on April 27, 2004, by representatives from U.S. EPA, Ohio EPA, the PRP Group, and the PRP Group's consultant (See Attachment B). The purpose of the inspections was to assess the protectiveness of the remedy, including the presence of fencing to restrict access, the integrity of the cover, and the condition of the dormant treatment system. The resulting slope built nearby to the landfill cover was also visually inspected.

No significant issues have been identified at any time regarding the cap, the drainage structures, or the fence. Examination of the cover revealed that there has been no subsidence or movement in the area. A few other minor issues included manhole covers unsecured and a few small openings in the fence. These issues were dealt with and confirmed on a subsequent site visit by Ohio EPA on June 2, 2004

Interviews

After the site inspection, Ohio EPA and U.S. EPA went to nearby residences to deliver a letter and questionnaire. Approximately sixteen of the nearby residents, were supplied with interview questionnaires, and one responded by May 5, 2004 (See Attachment A). No significant problems regarding the Site were identified during the interviews. However, a local resident expressed concern that the property is not mowed frequently enough.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

A review of the relevant documents results, and the results of the site inspection indicate that the remedy is functioning as intended by the ROD and access controls and institutional controls (ICs) are generally adequate to prevent exposure. The remedy has progressed and many of the major components described in the 1989 ROD have been completed or discontinued. These major components include: source area excavation, incineration on-site, disposal of treated material and backfilling on-site, ground water collection, ground water treatment on-site, discharge of treated

ground water to Conneaut Creek, and surface water monitoring. As a result of discontinuing these items, the overall protectiveness of human health and the environment have remained a priority at the Site.

The ICs that are in place include prohibitions on the use or disturbance of ground water, excavation activities, disturbance of the cap, and any other activities or actions that might interfere with the implemented remedy. No activities were observed that would have violated the institutional controls. The cap and the surrounding area were undisturbed, and no new uses of ground water were observed at the Site. One home was constructed near the landfill; however, excavating occurred above 4 foot in depth and the home was constructed outside the plume area.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. However, an additional exposure pathway may have been located at the Site.

Changes in Standards and To be Considered (TBC)

A list of the primary Applicable or Relevant and Appropriate Requirements (ARARs) and TBCs are included in Attachment C. There have been no changes in these ARARs and TBCs that affect the protectiveness of the remedy.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

An additional possible exposure pathway, which was not included in the ROD, is inhalation of indoor air. Due to the plume being in a residential area, Ohio EPA recommends that a detailed site-specific risk assessment be conducted to determine whether indoor air pathway is a major concern at the Site. Ohio EPA has conducted a preliminary baseline risk assessment of the most current ground water concentrations and the highest concentrations since the last Five-Year Review. This brief risk assessment is included in Attachment D. In addition, as indicated in the ROD, the fluctuations of the ground water levels may cause contamination to migrate into the perched aquifer. Contamination may reside in localized perched aquifers, which may additionally volatilize and affect the indoor air pathway.

There have been no changes in the remaining exposure assumptions that were used in the risk assessment that would affect the protectiveness of the remedy. Ohio EPA considers the assumptions in the baseline risk assessment to be conservative and reasonable in evaluating risk-based cleanup levels. No change to these assumptions or to the cleanup levels developed from them is warranted. There has been no change in the standardized risk assessment methodology that would affect the protectiveness of the remedy. Because the remedy implemented engineering and institutional controls to prevent contact with contaminants that remain at the Site, changes in contaminant toxicity would not impact the effectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Analytical results from the ground water monitoring have not indicated a concern of the protectiveness of the remedy. Ecological targets were not identified during the baseline risk assessment and none were identified during the first Five-Year Review and, therefore, monitoring of ecological targets may not be necessary. However, a study should be conducted to determine, by weight-of-evidence, that potential local expressions of ground water will not affect ecological and human targets. No weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the site inspection (SI), and the interviews, the remedy is functioning as intended by the ROD. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. There has been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

VIII. Issues

Table 4 - Issues

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Potential human exposure target - inhalation of indoor air.	N	Y
Ground water conditions and concentration trends may or may not support ongoing MNA, more data will be collected in September/October 2004.	N	Y

IX. Recommendations and Follow-Up Actions

Table 5 - Recommendations and Follow-Up Actions

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Human target - inhalation of indoor air.	Conduct a detailed risk assessment; potentially sample sub-slab, indoor air, soil gas, etc.	PRPs	State/EPA	3/31/2005	N	Y
Ground water conditions and concentration trends may or may not support ongoing MNA, more data will be collected in September/October 2004.	Evaluate all MNA data, evaluate effectiveness of natural attenuation.	PRPs	State/EPA	4/15/2005	N	Y

IX. Protectiveness Statement

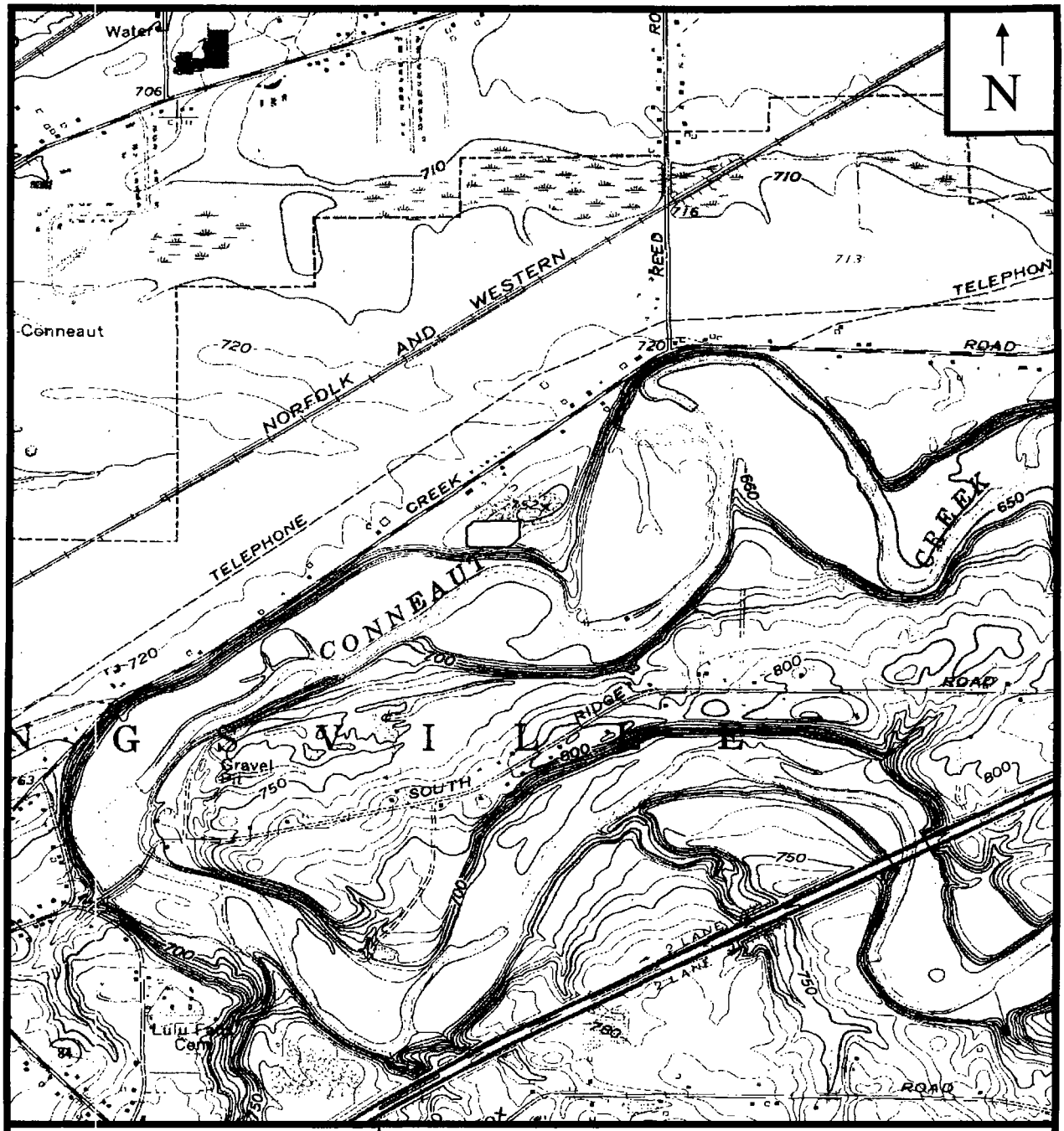
A protectiveness determination of the remedy at Big D Campground cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions: evaluating the results of the MNA Study and performing a detailed Risk Assessment concerning potential indoor air issues. It is expected that these actions will take approximately six to nine months to complete, at which time a protectiveness determination will be made. All immediate threats at the Site have been addressed.

All remaining threats at the Site have been addressed through stabilization and capping of contaminated soil, sediments, and ash, the installation of fencing and warning signs, and the implementation of institutional controls.

Long-term protectiveness of the remedial action will be verified by obtaining additional ground water samples to fully evaluate potential migration of the contaminant plume downgradient from the landfill area. Current data indicates that the plume remains on the deed restricted property. Additional sampling and analysis will be completed within the next six months.

XI. Next Review

The next Five-Year Review for the Big D Campground site is required by September 30, 2009, five years from the date of this review.



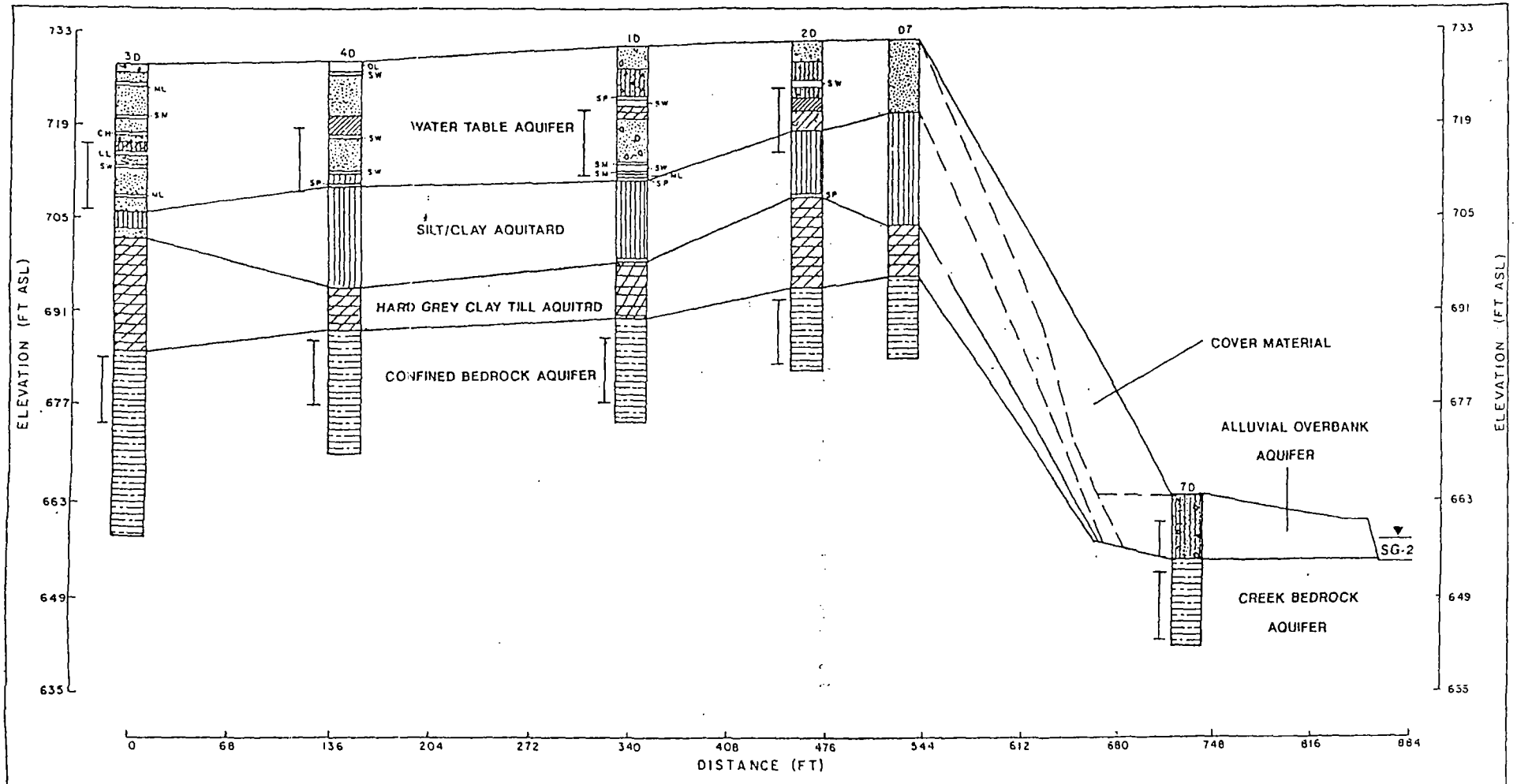
LEGEND

Approximate site location

BIG D CAMPGROUND SITE
KINGSVILLE, ASHTABULA COUNTY, OHIO
7.5 MINUTE QUADRANGLE

FIGURE 1: SITE LOCATION MAP

Ohio Environmental Protection Agency	SCALE : NOT TO SCALE



LEGEND

▼ Static water level (May 1987)

Note: D7 was completed by Olin prior to the RI.

SCREENED INTERVAL

SC, SM, SP, SW, ML, CL, OL, CH, MH, ML/CL, CL/ML, BR

PROJECT: BIG D CAMPGROUND

FILE: W64532R1

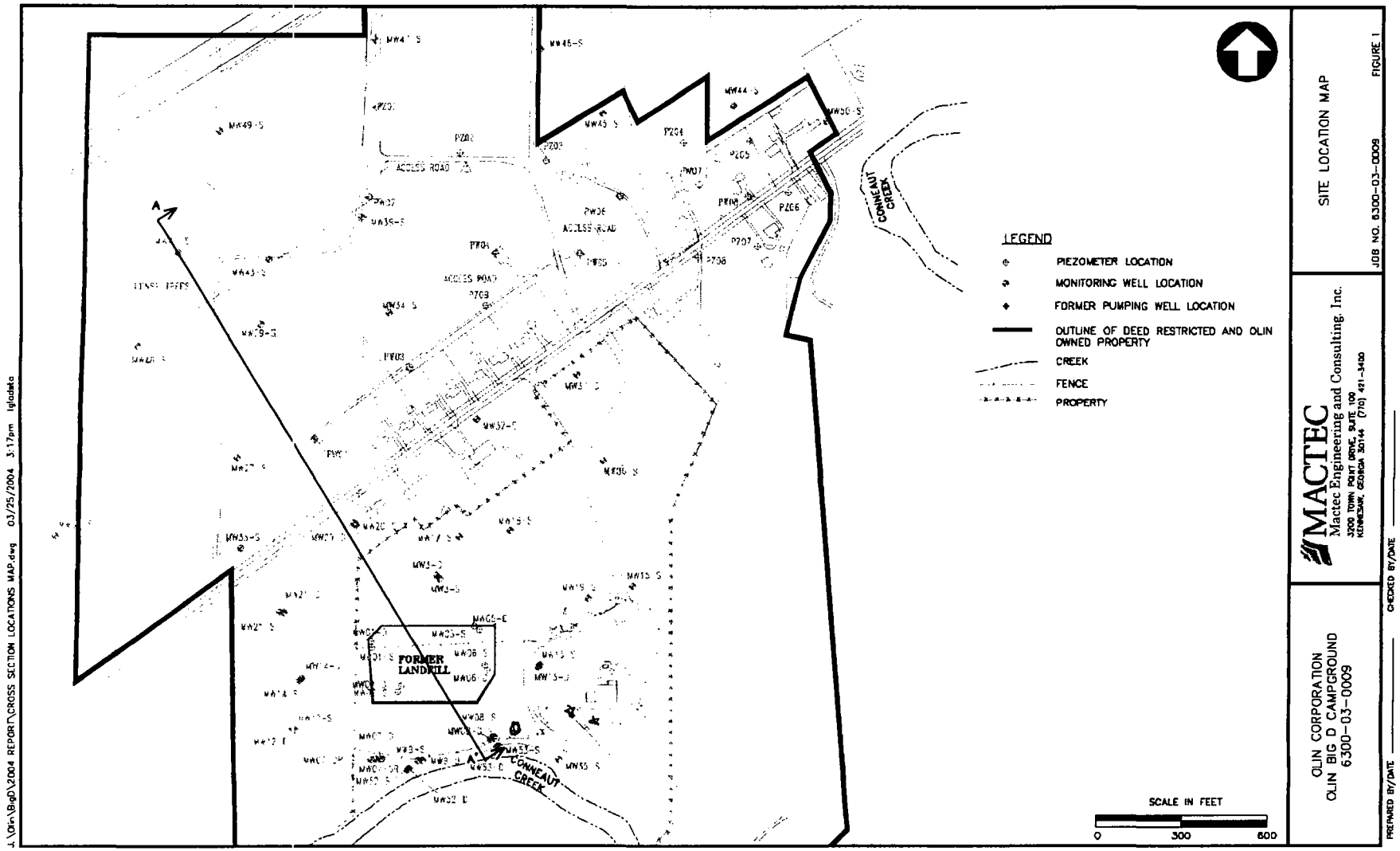
LOCATION: KINGSVILLE

FIGURE 2

GEOLOGIC CROSS SECTION
3D-SG2

PRC Environmental Management, Inc

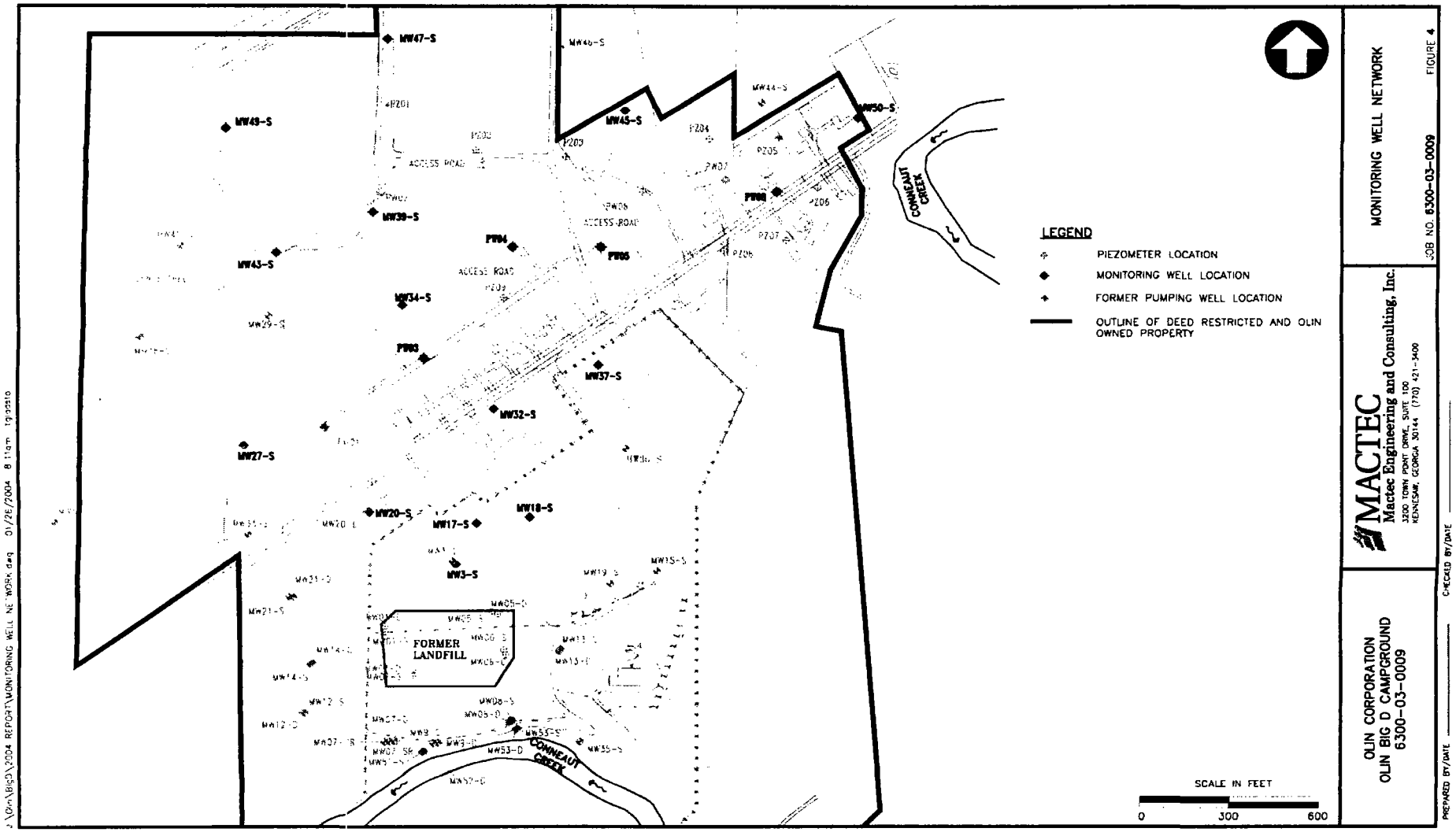
Site Description



* hole in bottom of fence

o unbolted sump cleanout

Monitoring Well Network



Big D Campground Site
Kingsville, Ashtabula County, Ohio

6/15/2004

Well Depth and Ground Water Elevation Data
TABLE 2

Well ID	TOC Elevation MSL (FT)	Ground Elevation MSL (FT)	Depth to Screen Bottom BGS (FT)	Mar-00		Sep-00		Mar-01		Sep-01		Jun-02		Feb-03		Aug-03		Apr-04	
				Depth to Water FT BTOC	Water Level Elevation MSL (FT)	Depth to Water FT BTOC	Water Level Elevation MSL (FT)	Depth to Water FT BTOC	Water Level Elevation MSL (FT)	Depth to Water FT BTOC	Water Level Elevation MSL (FT)	Depth to Water FT BTOC	Water Level Elevation MSL (FT)	Depth to Water FT BTOC	Water Level Elevation MSL (FT)	Depth to Water FT BTOC	Water Level Elevation MSL (FT)	Depth to Water FT BTOC	Water Level Elevation MSL (FT)
MW3S	728.44		20.50	17.44	711.00	19.15	709.29	17.88	710.56	24.90	703.54	14.46	713.98	17.38	711.06	15.81	712.63	14.48	713.96
MW17S	725.58	727.10	23.50	20.30	705.28	20.28	705.30	18.36	707.22	18.77	706.81	15.80	709.78	18.07	707.51	16.23	709.35	15.95	709.63
MW18S	733.60	731.10	25.00	22.61	710.99	23.68	709.92	19.81	713.79	20.41	713.19	19.64	713.96	22.18	711.42	20.9	712.70	19.95	713.65
MW20S	725.51	723.20	19.00	17.63	707.88	19.09	706.42	18.01	707.50	14.86	710.65	12.79	712.72	15.35	710.16	13.45	712.06	12.58	712.93
MW27S	721.72	719.30	22.50	10.64	711.08	16.23	705.49	14.69	707.03	NS		9.43	712.29	11.64	710.08	10.2	711.52	8.92	712.80
MW32S	727.82	725.30	29.40	20.53	707.29	19.89	707.93	19.72	708.10	16.11	711.71	15.42	712.40	17.96	709.86	16.57	711.25	15.15	712.67
MW34S	721.51	719.70	29.50	15.03	706.48	15.94	705.57	16.21	705.30	12.86	708.65	10.16	711.35	12.51	709.00	11.18	710.33	9.68	711.83
MW37S	725.90	724.60	33.00	19.78	706.12	19.28	706.62	18.78	707.12	18.17	707.73	16.21	709.69	17.8	708.10	16.78	709.12	15.9	710.00
MW39S	723.86	720.60	36.50	22.61	701.25	21.26	702.60	21.44	702.42	17.94	705.92	17.81	706.05	19.1	704.76	18.28	705.58	17.1	706.76
MW43S	722.15	719.60	37.10	15.92	706.23	17.90	704.25	15.93	706.22	15.63	706.52	13.91	708.24	15	707.15	13.8	708.35	12.35	709.80
MW45S	721.55	719.10	42.50	21.37	700.18	21.18	700.37	20.54	701.01	21.20	700.35	18.62	702.93	19.56	701.99	16.02	705.53	17.96	703.59
MW47S	719.76	717.50	47.50	17.30	702.46	17.89	701.87	18.14	701.62	15.82	703.94	14.35	705.41	15.7	704.06	15.1	704.66	13.57	706.19
MW49S	725.69	723.60	47.50	22.72	702.97	23.25	702.44	19.65	706.04	18.66	707.03	19.41	706.28	21.06	704.63	20.42	705.27	18.75	706.94
MW50S	718.37	718.80	40.30	23.31	695.06	23.02	695.35	24.09	694.28	21.96	696.41	22.62	695.75	23.08	695.29	22.51	695.86	22.3	696.07
PW03	722.49	716.78		16.89	705.60	16.57	705.92	15.43	707.06	12.70	709.79	10.41	712.08	12.71	709.78	11.43	711.06	9.95	712.54
PW04	719.31	713.73		22.35	696.96	17.11	702.20	16.87	702.44	11.60	707.71	13.53	705.78	14.78	704.53	14	705.31	12.2	707.11
PW05	720.07	714.49		21.90	698.17	18.70	701.37	24.61	695.46	16.41	703.66	15.80	704.27	17	703.07	16.22	703.85	15.21	704.86
PW08	720.07	714.55		25.14	694.93	21.52	698.55	22.00	698.07	14.18	705.89	20.22	699.85	20.77	699.30	20.17	699.90	19.77	700.30

Notes:

TOC	Top of Casing
MSL	Mean Sea Level
BGS	Below Ground Surface
NS	Not Sampled

Courtesy of Olin Corporation
Prepared by: TLN 5/23/02
Update by: SRG 6/1/04
Checked by: SEC 6/2/04
Modified by Ohio EPA on 6/14/04

Summary of Water Quality Data
TABLE 3

Sample Location	MW3-S							MW17-S						
Date Sampled	Mar-00	Sep-00	Mar-01	Oct-01	Jun-02	Feb-03	Aug-03	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03
VOCs (ug/L)		(DF = 500)	(DF = 200)		(DF = 100)	(DF = 10)	(DF = 8.33)	(DF=5)	(DF = 3.33)	(DF = 2.5)	(DF = 2.0)	(DF = 3.3)		
Monochlorobenzene	NS	**11000**	**5000**	(0.68)	**2100**	**3100** (DF = 100)	**2600** (DF = 83.33)	**150**	**37**	**46**	**53**	**31**	**16**	**14**
Chloroethane	NS	<1000	<400	<1	<100	<10	<8.3	<10	(1.7)	<5	<2.0	<3.3	<1.0	<1.0
cis-1,2-Dichloroethene	NS	<250	<100	<0.5	<50	**11**	**5.7**	**5.7**	**20**	**9.9**	**23**	**6.4**	**3.4**	**5.1**
trans-1,2-Dichloroethylene	NS	<250	<100	<0.5	<50	<5.0	<4.2	<2.5	(0.37)	<1.2	<1.0	<1.7	<0.50	<0.50
1,1-Dichloroethylene	NS	<500	<200	<1	<100	<10	<8.3	<2.5	<3.3	<2.5	<2.0	<3.3	<1.0	<1.0
Tetrachloroethylene	NS	<500	<200	<1	<100	<10	<8.3	(0.71)	<3.3	<2.5	<2.0	<3.3	<1.0	<1.0
Trichloroethylene	NS	<500	<200	(0.19)	<100	(6.8)	(6.1)	**32**	**89**	**100**	**39**	**92**	**39**	**29**
Vinyl Chloride	NS	<1000	<400	<1	<100	<10	(3.4)	<10	<1.4	(0.98)	<2.0	<3.3	(0.83)	(0.44)
Field Parameters														
pH (std. Units)	NS	7.3	7.2	8.0	6.9	7.10	6.25	7.4	7.3	7.4	7.8	6.9	7.29	6.57
Specific Conductance (uS/cm)	NS	1100	570	600	730	759	602	1200	920	530	440	760	543	595
Temperature (deg. C)	NS	14.00	8.20	11.80	10.79	8.91	12.65	11.10	16.20	9.70	12.90	12.26	10.34	13.23
Dissolved Oxygen (mg/L)	NS	1.70	1.92	1.60	4.17	1.31	2.63	0.20	2.04	2.54	2.90	0.56	0.13	0.62
ORP (mV)	NS	-27	191	10	-3.6	61.2	39.2	144	114	151	69	114	38.4	383.4
Turbidity (NTU)	NS	31.0	14.0	102.0	0.0	0.0	9.4	0.0	0.0	0.0	9.0	0.0	6.0	14.0
Iron II (mg/L)	NS	NS	NS	NS	NS	0.4	0.2	NS	NS	NS	NS	NS	0	
Geochemical Natural Attenuation Parameters (mg/L)														
Total Organic Carbon++	NS	NS	NS	NS	NS	4	3	NS	NS	NS	NS	NS	<1	<1
Chloride	NS	NS	NS	NS	NS	61.6 JB	46.2	NS	NS	NS	NS	NS	44.2 JB	54.8
Nitrate	NS	NS	NS	NS	NS	<0.50	<0.50	NS	NS	NS	NS	NS	<0.50	0.79
Sulfate	NS	NS	NS	NS	NS	146	123	NS	NS	NS	NS	NS	157	142
Total Alkalinity	NS	NS	NS	NS	NS	300	280	NS	NS	NS	NS	NS	230	250
Total Sulfide	NS	NS	NS	NS	NS	<1.0	<1.0	NS	NS	NS	NS	NS	<1.0	<1.0
Carbon Dioxide	NS	NS	NS	NS	NS	35	23	NS	NS	NS	NS	NS	17	15
Methane	NS	NS	NS	NS	NS	0.057	0.037	NS	NS	NS	NS	NS	0.0014	<0.0010
Ethylene	NS	NS	NS	NS	NS	0.0030	0.0051	NS	NS	NS	NS	NS	<0.0010	<0.0010
Hydrogen (nmol/L)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.2	1.6

Note:

NA = not available
<1.0 = Analyte was not detected, value listed is the reporting limit.
DF = Dilution Factor used to allow values to come within calibration range of the instrument.
NS = Not sampled for this parameter.
(3.3) = Result is less than the laboratory reporting limit, but greater than the instrument detection limit.
J = Estimated quantitation based upon QC data
JB = Estimated quantitation; possibly biased high or false positive based upon blank data
JL = Estimated quantitation; possibly biased low based upon QC data
R = Rejected data due to the testing of the sample outside of the required sample holding time.
E = Estimated result because concentration exceeds the calibration range.
* samples collected on 12/11/00
** Indicates that this data point was measured during a supplemental sampling event conducted in August 2002
+ Measurements for Feb-03 and Aug-03 were an order of magnitide greater than values from previous sampling events. Data prior to Feb-03 is under suspicion of being in the wrong units (mS/cm). The units have been corrected.
++ Prior to Feb-03, samples analyzed for dissolved organic carbon
1.92 = suspect data
VOC Concentrations in **bold** are those that were detected at concentrations greater than the reporting limit.

Courtesy of: Olin Corporation
Prepared By: SRG 09/08/2003
Checked By: AWE 09/09/2003
Modified by Ohio EPA on 6/14/04

Summary of Water Quality Data
TABLE 3 (continued)

Sample Location	MW18-S							MW20-S						
Date Sampled	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03	Mar-00	Sep-00	Mar-01	Oct-01	Jun-02	Feb-03	Aug-03
VOCs (ug/L)	(DF=8.33)		(DF = 2.5)	(DF = 2.5)				(DF=250)	(DF = 312.5)	(DF = 200)	(DF = 500)	(DF = 166.67)*	(DF = 20)	(DF = 25)
Monochlorobenzene	**210**	**1.6**	**58**	**58**	<1	(0.71)	<1.0	**5500**	**7500**	**4700**	**15000**	**4000**	**8500** (DF=500)	**7800** (DF=250)
Chloroethane	<17	<2	<5	<2.5	<1	<1.0	<1.0	<500	<620	<400	<500	<170	<20 JL	<25
cis-1,2-Dichloroethene	(1.3)	<0.5	(0.84)	**1.3**	<0.5	<0.50	<0.50	(35)	(41)	(59)	(140)	(42)	**67** JL	**65**
trans-1,2-Dichloroethylene	<4.2	<0.5	<1.2	<1.2	<0.5	<0.50	<0.50	<120	<160	<100	<250	<83	<10 JL	<12
1,1-Dichloroethylene	<8.3	<1.0	<2.5	<2.5	<1	<1.0	<1.0	<250	<310	<200	<500	<170	<20 JL	<25
Tetrachloroethylene	(1.0)	<1.0	<2.5	<2.5	<1	<1.0	<1.0	(56)	<310	<200	(150)	(39)	**55** JL	**60**
Trichloroethylene	(5.3)	<1.0	(1.8)	(1.5)	<1	(0.66)	<1.0	(120)	(160)	(140)	(330)	(120)	**150** JL	**150**
Vinyl Chloride	<17	<2.0	<5	<2.5	<1	<1.0	<1.0	<500	<620	<400	<500	<170	**21** JL	(17)
Field Parameters														
pH (std. Units)	7.55	7.20	7.20	7.60	6.92	7.11	6.66	7.83	7.00	7.30	6.80	6.82	7.03	6.73
Specific Conductance (uS/cm) [+]	1.60	1.60	720.00	170.00	980.00	686	876	1100.00	940.00	740.00	800.00	830.00	1340	1221
Temperature (deg. C)	11.1	15.9	8.94	12.4	11.5	7.58	13.66	10.1	13.9	9.10	13.4	11.01	9.99	12.52
Dissolved Oxygen (mg/L)	0.30	0.49	2.41	4.88	0.70	0.38	0.35	0.10	2.32	1.83	4.70	0.70	0.17	0.46
ORP (mV)	27	34	196	52	78	34.5	74.2	158	18	164	150	54	76.4	36.9
Turbidity (NTU)	0.0	18.2	2.0	0.0	0.0	1.1	11.1	0.0	0.0	9.0	0.0	0.0	0.0	12.4
Iron II (mg/L)	NS	NS	NS	NS	NS	0.4	0.6	0.5	ND	1.0	ND	ND	0.2	0.2
Geochemical Natural Attenuation Parameters (mg/L)														
Total Organic Carbon [++]	NS	NS	NS	NS	NS	1 JB	<1	3	17	3	4	5	3	3
Chloride	NS	NS	NS	NS	NS	70.3	90.3	94	140	188	212	156	330 (DF = 5)	284 (DF = 2)
Nitrate	NS	NS	NS	NS	NS	<0.50	<0.50	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50
Sulfate	NS	NS	NS	NS	NS	113	285 (DF = 2)	148	63	118	160	123	166 JL (DF = 5)	146
Total Alkalinity	NS	NS	NS	NS	NS	280	260	210	220	230	170	250	230	210
Total Sulfide	NS	NS	NS	NS	NS	<1.0	<1.0	<0.5	<1	<1	<1	<1	1.2	5.0
Carbon Dioxide	NS	NS	NS	NS	NS	31	24	14	15	17	23	17	26	18
Methane	NS	NS	NS	NS	NS	<0.0010	<0.0010	0.0015	0.0031	0.0044	0.024	0.0054	0.0075	0.0060
Ethylene	NS	NS	NS	NS	NS	<0.0010	<0.0010	0.007	0.010	0.003	0.008	<0.001	0.0051	0.0038
Hydrogen (nmol/L)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.83	0.67

Note:

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JL = Estimated quantitation; possibly biased low based upon QC data
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E = Estimated result because concentration exceeds the calibration range.
* samples collected on 12/11/00
** Indicates that this data point was measured during a supplemental sampling event conducted in August 2002
[+] Measurements for Feb-03 and Aug-03 were an order of magnitide greater than values from previous sampling events. Data prior to Feb-03 is under suspicion of being in the wrong units (mS/cm). The units have been corrected.
[++] Prior to Feb-03, samples analyzed for dissolved organic carbon
1.92 = suspect data
VOC Concentrations in **bold** are those that were detected at concentrations greater than the reporting limit.

Courtesy of: Olin Corporation
Prepared By: SRG 09/08/2003
Checked By: AWE 09/09/2003
Modified by Ohio EPA on 6/14/04

Summary of Water Quality Data
TABLE 3 (continued)

Sample Location	MW27-S							MW32-S						
Date Sampled	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03
VOCs (ug/L)			(DF = 5)											
Monochlorobenzene	**28**	<1 *	**110**	<1	<1	<1.0	<1.0	<1	<1	<1	<1	<1	<1.0	<1.0
Chloroethane	<2	<2 *	<10	<1	<1	<1.0	<1.0	(1.0)	(1.2)	<2	<1	(0.49)	(0.73) J	(0.42)
cis-1,2-Dichloroethene	<0.5	<0.5 *	(1.6)	<0.5	<0.5	<0.50	<0.50	(0.17)	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
trans-1,2-Dichloroethylene	<0.5	<0.5 *	<2.5	<0.5	<0.5	<0.50	<0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
1,1-Dichloroethylene	<1	<1	<5	<1	<1	<1.0	<1.0	<1	<1	<1	<1	<1	<1.0	<1.0
Tetrachloroethylene	(0.17)	<1	<5	<1	<1	<1.0	<1.0	<1	<1	<1	<1	<1	<1.0	<1.0
Trichloroethylene	(0.29)	<1 *	(3.3)	<1	<1	<1.0	<1.0	(0.42)	(0.22)	(0.35)	<0.22	(0.28)	<1.0	<1.0
Vinyl Chloride	<2	<2 *	<10	<1	<1	<1.0	<1.0	**8.9**	**14**	<2	<1	**14**	**20**	**14**
Field Parameters														
pH (std. Units)	5.78	6.1	7.70	6.5	5.24	5.73	5.45	7.6	6.5	7.20	7.6	6.68	7.19	6.50
Specific Conductance (uS/cm)	90	660	90	700	140	120	107	700	560	360	770	590	535	493
Temperature (deg. C)	8.9	16.4	5.2	11.6	10.4	6.32	15.02	10.9	18.1	6.5	15.0	12.9	11.00	11.90
Dissolved Oxygen (mg/L)	10.5	1.8	1.1	1.4	2.9**	0.87	9.50	4.7	6.9	6.5	4.0	3.2	1.00	5.16
ORP (mV)	255	176	184	168	297	301.1	384.4	212	151	173	92	113.1	143.5	235.7
Turbidity (NTU)	0	0	0	11	3**	0.1	7.4	73	69	75	23	100	6.6	18.2
Iron II (mg/L)	NS	NS	NS	NS	NS	0	0	ND	ND	ND	ND	ND	0	0
Geochemical Natural Attenuation Parameters (mg/L)														
Total Organic Carbon++	NS	NS	NS	NS	NS	1 JB	<1	<1	2	<1	<1	6	1 JB	<1
Chloride	NS	NS	NS	NS	NS	2.5 JB	4.2	77.1	44.6	27.6	19.3	74	36.1 JB (DF = 5)	87.3
Nitrate	NS	NS	NS	NS	NS	16.8 (DF = 2)	6.3	2.2	2.9 R	2.7	2.3	1.6	1.2	1.2
Sulfate	NS	NS	NS	NS	NS	9.4	14.3	78.2	72.4	45.5	45.4	55.7	43.5 JB (DF = 5)	48.1
Total Alkalinity	NS	NS	NS	NS	NS	8.1	13	220	210	200	190	220	190	170
Total Sulfide	NS	NS	NS	NS	NS	<1.0	<1.0	<0.5	<1	<1	<1	<1	<1.0	<1.0
Carbon Dioxide	NS	NS	NS	NS	NS	8.4	23	28	22	21	17.95	27	26	28
Methane	NS	NS	NS	NS	NS	<0.0010	<0.0010	0.002	<0.001	<0.001	<0.001	<0.001	0.0011	0.0010
Ethylene	NS	NS	NS	NS	NS	<0.0010	<0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010
Hydrogen (nmol/L)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Note:
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NS = Not sampled for this parameter.
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R = Rejected data due to the testing of the sample outside of the required sample holding time.
E = Estimated result because concentration exceeds the calibration range.
* samples collected on 12/11/00
** Indicates that this data point was measured during a supplemental sampling event conducted in August 2002
+ Measurements for Feb-03 and Aug-03 were an order of magnitide greater than values from previous sampling events. Data prior to Feb-03 is under suspicion of being in the wrong units (mS/cm). The units have been corrected.
++ Prior to Feb-03, samples analyzed for dissolved organic carbon
1.92 = suspect data
VOC Concentrations in bold are those that were detected at concentrations greater than the reporting limit.

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Prepared By: SRG 09/08/2003
Checked By: AWE 09/09/2003
Modified by Ohio EPA on 6/14/04

Summary of Water Quality Data
TABLE 3 (continued)

Sample Location	MW34-S							MW37-S						
Date Sampled	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03
VOCs (ug/L)	(DF=5)				(DF = 33.33)	(DF = 1.67)	(DF = 2.86)			(DF = 2)				
Monochlorobenzene	<5	<1	<1	<1	**230**	**250** E	**550** (DF = 28.57)	(0.81)	<1	**49**	<1	<1	<1.0	<1.0
Chloroethane	(2.3)	(0.41)	<2	<1	<33	(1.6) J	(1.2)	<2	<2	<4	<1	<1	<1.0	<1.0
cis-1,2-Dichloroethene	**190**	**18**	**13**	**11**	**1000**	**730** E	**790** (DF = 28.57)	<0.5	<0.5	(0.6)	(0.27)	<0.5	<0.50	<0.50
trans-1,2-Dichloroethylene	**3.3**	<0.5	<0.5	<0.5	(7)	**24**	**8.3**	<0.5	<0.5	<1	<0.5	<0.5	<0.50	<0.50
1,1-Dichloroethylene	<5	<1	<1	<1	<33	**4.6**	**4.5**	<1	<1	<2	<1	<1	<1.0	<1.0
Tetrachloroethylene	<5	<1	<1	<1	<33	<1.7	<1.0	<1	<1	<2	<1	<1	<1.0	<1.0
Trichloroethylene	**17**	(0.59)	<1	<1	**370**	**460** E	**550** (DF = 28.57)	<1	<1	(1.2)	<1	<1	<1.0	<1.0
Vinyl Chloride	**41**	**3.0**	**8.2**	(0.93)	**110**	**57**	**33** (DF = 28.57)	<2	<2	<4	<1	<1	<1.0	<1.0
Field Parameters														
pH (std. Units)	7.65	8.2	8.00	7.6	7.01	7.75	6.59	7.4	7.0	7.60	6.1	6.83	7.21	6.36
Specific Conductance (uS/cm)	610	570	290	650	760	716	526	740	580	260	220	570	575	495
Temperature (deg. C)	10.7	15	7.10	13.8	14.06	10.08	12.61	11.3	17.9	4.50	9.8	12.14	11.22	13.02
Dissolved Oxygen (mg/L)	0.5	5.6	4.4	1.0	1.3	0.20	0.57	0.3	1.5	5.0	7.3	1.3	0.10	1.98
ORP (mV)	211	119	172	180	-59	-57.6	-87.1	181	120	197	191	198	163.9	395.9
Turbidity (NTU)	0.0	16.0	29.0	0.0	214.0	0.0	6.3	0.0	38.0	3.0	4.0	0.0	0.0	8.2
Iron II (mg/L)	0.5	ND	ND	1	0.7	1.4	1.6	NS	NS	NS	NS	NS	0	0
Geochemical Natural Attenuation Parameters (mg/L)														
Total Organic Carbon++	2	2	<1	<1	5	2 JB	2	NS	NS	NS	NS	NS	1 JB	<1
Chloride	63.1	41.2	43.6	53.6	95.4	93.2 JB	81.8	NS	NS	NS	NS	NS	23.7	23.2
Nitrate	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	NS	NS	NS	NS	NS	2.6	3.4
Sulfate	46.2	40.6	36	35.8	72.6	63.9 JB (DF = 5)	75.4	NS	NS	NS	NS	NS	62.5 (DF = 2)	65.2
Total Alkalinity	250	200	190	190	260	240	240	NS	NS	NS	NS	NS	240	230
Total Sulfide	<0.5	<1	<1	<1	<1	1.8	<1.0	NS	NS	NS	NS	NS	<1.0	<1.0
Carbon Dioxide	11	3.6	4.2	4.87	19	18	15	NS	NS	NS	NS	NS	19	19
Methane	0.009	0.003	0.002	0.006	0.0043	0.0054	0.0024	NS	NS	NS	NS	NS	<0.0010	<0.0010
Ethylene	0.001	<0.001	0.002	<0.001	0.002	0.0022	<0.0010	NS	NS	NS	NS	NS	<0.0010	<0.0010
Hydrogen (nmol/L)	NS	NS	NS	NS	NS	5.5	1.4	NS	NS	NS	NS	NS	NS	NS

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** Indicates that this data point was measured during a supplemental sampling event conducted in August 2002
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VOC Concentrations in **bold** are those that were detected at concentrations greater than the reporting limit.

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Checked By: AWE 09/09/2003
Modified by Ohio EPA on 6/14/04

Summary of Water Quality Data
TABLE 3 (continued)

Sample Location	MW39-S							MW43-S						
Date Sampled	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03
VOCs (ug/L)					(DF = 1.67)									
Monochlorobenzene	<1.2	<1 ND	<1	<1	<1.7	<1.0	<1.0	(0.6)	<1	<1	<1	<1	<1.0	<1.0
Chloroethane	<2.5	<2 ND	<2	<1	<1.7	(0.43)	(0.90)	<2	<2	<2	<1	<1	<1.0 J	<1.0
cis-1,2-Dichloroethene	<0.62	<0.5 ND	<0.5	<0.5	<0.84	<0.50	<0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
trans-1,2-Dichloroethylene	<0.62	<0.5 ND	<0.5	<0.5	<0.84	<0.50	<0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
1,1-Dichloroethylene	<1.2	<1 ND	<1	<1	<1.7	<1.0	<1.0	<1	<1	<1	<1	<1	<1.0	<1.0
Tetrachloroethylene	<1.2	<1 ND	<1	<1	<1.7	<1.0	<1.0	<1	<1	<1	<1	<1	<1.0	<1.0
Trichloroethylene	<1.2	<1 ND	<1	<1	<1.7	<1.0	<1.0	<1	<1	<1	<1	<1	<1.0	<1.0
Vinyl Chloride	**13**	**2.3**	(1.8)	(0.8)	**45**	**38** (DF = 2)	**33** (DF = 1.43)	**8.4**	<2	<2	<1	**39**	**44** E	**30**
Field Parameters														
pH (std. Units)	**7.83**	7.1	**8.1**	**7.9**	**7.2**	**7.59**	**7.45**	8.8	8.5	8.2	8.8	7.3	7.67	8.59
Specific Conductance (uS/cm)	**500**	**470**	**280**	**480**	**700**	**411**	**483**	290	320	220	300	120	664	198
Temperature (deg. C)	**10.9**	**19.7**	**8.6**	**17.0**	**13.6**	**8.68**	**12.58**	10.5	14.0	8.6	8.5	12.6	10.32	12.16
Dissolved Oxygen (mg/L)	**0.1**	**1.57**	6.2	1.0	2.8**	**0.17**	**0.47**	1.4	3.7	5.5	2.4	0.6	0.08	0.55
ORP (mV)	**1.38**	**37**	187	96	-100	**-56.8**	**-159.4**	179	120	123	157	(88)	-60.3	268.3
Turbidity (NTU)	**4.0**	**60.2**	**21**	**0**	**2****	**4.9**	**9.1**	48	19	1	0	0	0.6	7.6
Iron II (mg/L)	NS	NS	NS	NS	NS	1.5	**3.2**	ND	ND	ND	NS	0.2	1.2	0
Geochemical Natural Attenuation Parameters (mg/L)														
Total Organic Carbon++	NS	NS	NS	NS	NS	2 JB	1	2	2	<1	<1	4	2 JB	1
Chloride	NS	NS	NS	NS	NS	69.8	74.6	8.3	4.8	3.7	4.3	99.7	97.8 JB	32.3
Nitrate	NS	NS	NS	NS	NS	<0.50	<0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
Sulfate	NS	NS	NS	NS	NS	47.9	56.1	28.2	19.8	17.3	18.5	52.4	48.2 JB (DF = 5)	42.8
Total Alkalinity	NS	NS	NS	NS	NS	210	210	190	130	120	120	210	220	140
Total Sulfide	NS	NS	NS	NS	NS	<1.0	<1.0	<0.5	<1	<1	2.4	<1	<1.0	<1.0
Carbon Dioxide	NS	NS	NS	NS	NS	11	10	4.8	0.66	0.4	0.4	9.3	18	1.1
Methane	NS	NS	NS	NS	NS	0.0033	0.0076	0.0016	<0.001	0.0011	0.001	0.0073	0.0090	0.0047
Ethylene	NS	NS	NS	NS	NS	0.0016	0.0015	<0.001	<0.001	<0.001	<0.001	0.0029	0.0020	0.0015
Hydrogen (nmol/L)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

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* samples collected on 12/11/00
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++ Prior to Feb-03, samples analyzed for dissolved organic carbon
1.92 = suspect data
VOC Concentrations in **bold** are those that were detected at concentrations greater than the reporting limit.

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Prepared By: SRG 09/08/2003
Checked By: AWE 09/09/2003
Modified by Ohio EPA on 6/14/04

Summary of Water Quality Data
TABLE 3 (continued)

Sample Location	MW45-S							MW47-S						
Date Sampled	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03
VOCs (ug/L)														
Monochlorobenzene	(0.18)	0.31	<1	<1	<1	<1.0 JL	<1.0	<1	<1	<1	<1	<1	<1.0 JL	<1.0
Chloroethane	<2	<2	<2	<1	<1	<1.0 JL	<1.0	<2	<2	<2	<1	<1	<1.0 JL	<1.0
cis-1,2-Dichloroethene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 JL	<0.50	<0.5	(0.12)	<0.5	<0.5	<0.5	<0.5 JL	<0.50
trans-1,2-Dichloroethylene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 JL	<0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 JL	<0.50
1,1-Dichloroethylene	<1	<1	<1	<1	<1	<1.0 JL	<1.0	<1	<1	<1	<1	<1	<1.0 JL	<1.0
Tetrachloroethylene	<1	<1	<1	<1	<1	<1.0 JL	<1.0	<1	<1	<1	<1	<1	<1.0 JL	<1.0
Trichloroethylene	(0.055)	<1	<1	<1	<1	<1.0 JL	<1.0	<1	<1	<1	<1	<1	<1.0 JL	<1.0
Vinyl Chloride	<2	<2	<2	<1	<1	<1.0 JL	<1.0	<2	<2	<2	<1	<1	<1.0 JL	<1.0
Field Parameters														
pH (std. Units)	8.0	7.6	8.10	7.2	7.5	7.80	6.60	11.92	9.2	9.60	10.3	7.54	9.02	7.76
Specific Conductance (uS/cm)	950	910	410	600	120	654	487	690	600	360	610	450	532	360
Temperature (deg. C)	11.2	16.4	6.80	11.3	14.1	8.06	13.44	11.1	13.2	9.00	14.9	13.1	9.43	12.58
Dissolved Oxygen (mg/L)	0.1	2.12	5.8	1.4	0.6	0.05	1.16	1.8	3.6	5.1	2.0	1.05	0.06	0.95
ORP (mV)	-144	-113	174	41	-133	-93.7	-124.1	13	77	180	39	-45.8	101.5	140.1
Turbidity (NTU)	447.0	23.7	15.0	16.0	4.0	0.8	38.1	0.0	10.5	3.0	4.0	99.8	2.0	2.4
Iron II (mg/L)	1.1	ND	ND	NS	0.1	1.2	1.4	ND	ND	ND	ND	ND	<0.2	0.4
Geochemical Natural Attenuation Parameters (mg/L)														
Total Organic Carbon++	31	5	2	1	5	3 JB	3	<1	<1	<1	<1	1	1 JB	<1
Chloride	171	151	121	112	98.6	85.9	78.7	96.5	98.8	132	13.8	42.3	72.8	51.4
Nitrate	<0.5	<0.5 R	<0.5	<0.5	<0.5	<0.50	<0.50	<0.5	<0.5 R	<0.5	<0.5	<0.5	<0.50	<0.50
Sulfate	58.6	57.8	52.3	59.4	59.6	59.5	54.5	70.7	70.6	65.5	81.7	85.4	75.3	81.1
Total Alkalinity	170	180	180	180	180	170	180	47	45	35	140	130	82	100
Total Sulfide	<0.5	<1	<1	3.2	<1	<1.0	<1.0	0.63	<1	<1	1.1	<1	<1.0	<1.0
Carbon Dioxide	5.5	4	3.4	3.32	4.7	4.5	5.3	0.3	0.34	<0.17	2.4	2.6	0.65	1.1
Methane	0.015	0.0062	0.0074	0.0059	0.0056	0.0055	0.0051	0.0025	0.003	0.0021	<0.00087	0.0017	0.0049	0.0016
Ethylene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010
Hydrogen (nmol/L)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Note:

NA = not available
<1.0 = Analyte was not detected, value listed is the reporting limit.
DF = Dilution Factor used to allow values to come within calibration range of the instrument.
NS = Not sampled for this parameter.
(3.3) = Result is less than the laboratory reporting limit, but greater than the instrument detection limit (J).
J = Estimated quantitation based upon QC data
JB = Estimated quantitation; possibly biased high or false positive based upon blank data
JL = Estimated quantitation; possibly biased low based upon QC data
R = Rejected data due to the testing of the sample outside of the required sample holding time.
E = Estimated result because concentration exceeds the calibration range.
* samples collected on 12/11/00
** Indicates that this data point was measured during a supplemental sampling event conducted in August 2002
+ Measurements for Feb-03 and Aug-03 were an order of magnitide greater than values from previous sampling events. Data prior to Feb-03 is under suspicion of being in the wrong units (mS/cm). The units have been corrected.
++ Prior to Feb-03, samples analyzed for dissolved organic carbon
1.92 = suspect data
VOC Concentrations in bold are those that were detected at concentrations greater than the reporting limit.

Courtesy of: Olin Corporation
Prepared By: SRG 09/08/2003
Checked By: AWE 09/09/2003
Modified by Ohio EPA on 6/14/04

Summary of Water Quality Data
TABLE 3 (continued)

Sample Location	MW49-S							MW50-S						
Date Sampled	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03
VOCs (ug/L)		(DF = 1.67)												
Monochlorobenzene	<1	1.8	<1	<1	<1	<1.0	<1.0	<1	<1 *	<1	<1	<1	<1.0 JL	<1.0
Chloroethane	<2	<3.3	<2	<1	<1	<1.0	<1.0	<2	<2 *	<2	<1	<1	<1.0 JL	<1.0
cis-1,2-Dichloroethene	<0.5	<0.84	<0.5	<0.5	<0.5	<0.5	<0.50	<0.5	<0.5 *	<0.5	<0.5	<0.5	<0.5 JL	<0.50
trans-1,2-Dichloroethylene	<0.5	<0.84	<0.5	<0.5	<0.5	<0.5	<0.50	<0.5	<0.5 *	<0.5	<0.5	<0.5	<0.5 JL	<0.50
1,1-Dichloroethylene	<1	<1.7	<1	<1	<1	<1.0	<1.0	<1	<1	<1	(0.69)	<1	<1.0 JL	<1.0
Tetrachloroethylene	<1	<1.7	<1	<1	<1	<1.0	<1.0	<1	<1	<1	<1	<1	<1.0 JL	<1.0
Trichloroethylene	<1	<1.7	<1	<1	<1	<1.0	<1.0	<1	<1 *	<1	<1	<1	<1.0 JL	<1.0
Vinyl Chloride	<2	<3.3	<2	<1	<1	(0.53)	1.8	<2	<2 *	<2	<1	<1	<1.0 JL	<1.0
Field Parameters														
pH (std. Units)	7.82	7.6	8.10	7.3	7.46	7.65	5.40	8.16	7.4	7.50	7.1	7.13	7.29	5.16
Specific Conductance (uS/cm)	780	710	310	470	110	547	503	530	560	310	540	560	728	556
Temperature (deg. C)	11.6	20.2	6.59	11.8	15.59	10.25	14.75	11.2	16.0	7.00	16.5	12.78	7.87	13.67
Dissolved Oxygen (mg/L)	0.0	2.79	4.9	1.1	0.7	0.32	1.15	0.2	2.2	6.8	2.3	2.28	0.04	0.98
ORP (mV)	-112	-60	62	0	-108	-106.2	-104.5	66	92	131	78	-39.4	51.7	36.2
Turbidity (NTU)	18.1	28	6	34	41.0	0.9	0	15	87	5	59	0.0	1.0	150^
Iron II (mg/L)	NS	NS	NS	NS	NS	1.0	1.4	ND	ND	0.5	0.5	0.2	0.8	NS
Geochemical Natural Attenuation Parameters (mg/L)														
Total Organic Carbon++	NS	NS	NS	NS	NS	1 JB	1	1	2	<1	<1	1	2 JB	2
Chloride	NS	NS	NS	NS	NS	86.4	87.4	21	29.9	26.5	42.9	96.5	140	147
Nitrate	NS	NS	NS	NS	NS	<0.50	<0.50	<0.5	<0.5 R	<0.5	<0.5	<0.5	<0.50	<0.50
Sulfate	NS	NS	NS	NS	NS	43.6 (DF = 2)	47.7	76.6	78.8	77.8	80.6	76	75.4	71.7
Total Alkalinity	NS	NS	NS	NS	NS	150	160	150	140	150	150	130	110	100
Total Sulfide	NS	NS	NS	NS	NS	<1.0	2.8	0.63	<1	<1	<1	<1	<1.0	<1.0
Carbon Dioxide	NS	NS	NS	NS	NS	4.4	4.9	5.8	4.1	4.9	3.77	4.5	5.8	5.1
Methane	NS	NS	NS	NS	NS	0.0051	0.0026	0.0043	0.0048	<0.001	0.0011	0.0033	0.0070	0.0036
Ethylene	NS	NS	NS	NS	NS	<0.0010	<0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	0.0045	<0.0010
Hydrogen (nmol/L)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Note:

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DF = Dilution Factor used to allow values to come within calibration range of the instrument.
NS = Not sampled for this parameter.
(3.3) = Result is less than the laboratory reporting limit, but greater than the instrument detection limit (J).
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JL = Estimated quantitation; possibly biased low based upon QC data
R = Rejected data due to the testing of the sample outside of the required sample holding time.
E = Estimated result because concentration exceeds the calibration range.
* samples collected on 12/11/00
** Indicates that this data point was measured during a supplemental sampling event conducted in August 2002

+ Measurements for Feb-03 and Aug-03 were an order of magnitide greater than values from previous sampling events. Data prior to Feb-03 is under suspicion of being in the wrong units (mS/cm). The units have been corrected.

++ Prior to Feb-03, samples analyzed for dissolved organic carbon
1.92 = suspect data
VOC Concentrations in bold are those that were detected at concentrations greater than the reporting limit.
^Turbidity Hight due to presence of ants in purge water

Courtesy of: Olin Corporation
Prepared By: SRG 09/08/2003
Checked By: AWE 09/09/2003
Modified by Ohio EPA on 6/14/04

Summary of Water Quality Data
TABLE 3 (continued)

Sample Location	PW03							PW04						
Date Sampled	Mar-00	Sep-00	Mar-01	Oct-01	Jun-02	Feb-03	Aug-03	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03
VOCs (ug/L)	(DF = 10)	(DF = 100)	(DF = 10)	(DF = 100)	(DF = 33.33)		(DF = 7.14)							
Monochlorobenzene	**37**	**1300**	(6.6)	**3000**	(28)	**4.7**	**1300** (DF = 71.43)	**1.2**	(0.62)	<1	(0.31)	<1	<1.0	**2.8**
Chloroethane	<20	<200	<20	<100	<33	<1.0	**<7.1**	**7.8**	(0.85)	<2	(0.7)	<1	<1.0	<1.0
cis-1,2-Dichloroethene	**280**	**2700**	**290**	**3200**	**870**	**210** (DF = 8)	**2200** (DF = 71.43)	**1.2**	(0.26)	<0.5	<0.5	<0.5	<0.5	**4.8**
trans-1,2-Dichloroethylene	**10**	**80**	**9.3**	**150**	**61**	**18**	**280** (DF = 71.43)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	(0.36)
1,1-Dichloroethylene	(1.2)	<100	<10	(42)	<33	**2.0**	**10**	<1	<1	<1	<1	<1	<1.0	<1.0
Tetrachloroethylene	<10	<100	<10	<100	<33	<1.0	**<7.1**	<1	<1	<1	<1	<1	<1.0	<1.0
Trichloroethylene	**54**	**890**	**66**	**600**	(6.2)	**33**	**210** (DF = 71.43)	(0.18)	**1.3**	(0.58)	(0.73)	(0.69)	<1.0	(0.93)
Vinyl Chloride	(9.4)	**260**	**22**	**710**	**210**	**4.8**	**470** (DF = 71.43)	**38**	(1.8)	<2	**15**	<1	<1.0	<1.0
Field Parameters														
pH (std. Units)	**8.43**	7.5	**7.80**	**8.4**	**6.92**	**8.23**	**6.44**	8.3	8.2	7.30	8.1	7.8	7.62	7.58
Specific Conductance (uS/cm)	**560**	750	**380**	**570**	**900**	**385**	**702**	580	1010	360	760	900	608	458
Temperature (deg. C)	**10.7**	15	**10.12**	**14.9**	**12.67**	**5.26**	**13.85**	10.9	15.9	5.90	15.5	14.18	9.88	12.30
Dissolved Oxygen (mg/L)	**1.9**	**1.76**	6.5	1.7	1.1	**4.16**	**0.55**	3.1	5.5	8.8	5.4	4.29	0.63	0.88
ORP (mV)	182	-57	208	93	-38	134.9	**6.8**	223	120	139	93	110	195.4	340.2
Turbidity (NTU)	3.8	0.0	26.0	45	0.0	0.0	**7.5**	0.0	0.0	6.0	5.0	0.0	7.4	8.4
Iron II (mg/L)	NS	NS	NS	NS	NS	NS	**0**	NS	NS	NS	NS	NS	0	0
Geochemical Natural Attenuation Parameters (mg/L)														
Total Organic Carbon[++]	NS	NS	NS	NS	NS	4	**3**	NS	NS	NS	NS	NS	8	8
Chloride	NS	NS	NS	NS	NS	14.6 JB	**118**	NS	NS	NS	NS	NS	19.7	9.8
Nitrate	NS	NS	NS	NS	NS	0.82	**<0.50**	NS	NS	NS	NS	NS	0.87	0.85
Sulfate	NS	NS	NS	NS	NS	46.1	**104**	NS	NS	NS	NS	NS	58.5 (DF = 5)	38.5
Total Alkalinity	NS	NS	NS	NS	NS	220	**250**	NS	NS	NS	NS	NS	300	300
Total Sulfide	NS	NS	NS	NS	NS	<1.0	**<1.0**	NS	NS	NS	NS	NS	<1.0	<1.0
Carbon Dioxide	NS	NS	NS	NS	NS	2.0	**16**	NS	NS	NS	NS	NS	8.4	4.8
Methane	NS	NS	NS	NS	NS	<0.0010	**0.0026**	NS	NS	NS	NS	NS	<0.0010	<0.0010
Ethylene	NS	NS	NS	NS	NS	<0.0010	**0.022**	NS	NS	NS	NS	NS	<0.0010	<0.0010
Hydrogen (nmol/L)	NS	NS	NS	NS	NS	1.5	**2.3**	NS	NS	NS	NS	NS	NS	NS

Note:

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<1.0 = Analyte was not detected, value listed is the reporting limit.
DF = Dilution Factor used to allow values to come within calibration range of the instrument.
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E = Estimated result because concentration exceeds the calibration range.
* samples collected on 12/11/00
** Indicates that this data point was measured during a supplemental sampling event conducted in August 2002
[+] Measurements for Feb-03 and Aug-03 were an order of magnitide greater than values from previous sampling events. Data prior to Feb-03 is under suspicion of being in the wrong units (mS/cm). The units have been corrected.
[++] Prior to Feb-03, samples analyzed for dissolved organic carbon
1.92 = suspect data
VOC Concentrations in **bold** are those that were detected at concentrations greater than the reporting limit.

Courtesy of: Olin Corporation
Prepared By: SRG 09/08/2003
Checked By: AWE 09/09/2003
Modified by Ohio EPA on 6/14/04

Summary of Water Quality Data
TABLE 3 (continued)

Sample Location	PW05							PW08						
Date Sampled	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03	Mar-00	Sep-00	Mar-01	Sep-01	Jun-02	Feb-03	Aug-03
VOCs (ug/L)														
Monochlorobenzene	<1	<1	<1	<1	<1	<1.0	<1.0	(0.096)	<1	<1	<1	<1	<1.0	<1.0
Chloroethane	<2	<2	<2	(0.6)	(0.41)	1.1 J	(0.74)	<2	<2	<2	<1	<1	<1.0	<1.0
cis-1,2-Dichloroethene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	5.3	(0.18)	<0.5	<0.5	<0.5	<0.5	<0.50
trans-1,2-Dichloroethylene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	(0.092)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50
1,1-Dichloroethylene	<1	<1	<1	<1	<1	<1.0	<1.0	<1	<1	<1	<1	<1	<1.0	<1.0
Tetrachloroethylene	<1	<1	<1	<1	<1	<1.0	<1.0	<1	<1	<1	<1	<1	<1.0	<1.0
Trichloroethylene	<1	<1	<1	<1	<1	<1.0	<1.0	(0.91)	<1	<1	<1	<1	<1.0	<1.0
Vinyl Chloride	<2	<2	<2	38	(0.5)	25	1.8	5.5	<2	<2	<1	(0.71)	(0.61)	(0.59)
Field Parameters														
pH (std. Units)	7.19	7.8	7.50	7.4	7.4	7.57	4.20	7.72	7.7	7.6	7.7	7.47	7.63	6.81
Specific Conductance (uS/cm)	770	1010	490	490	110	595	518	690	690	430	640	110	597	540
Temperature (deg. C)	11	15.6	7.50	17.4	13.73	8.84	14.90	11.7	15.0	8.5	14.2	13.98	9.24	14.51
Dissolved Oxygen (mg/L)	6.50	1.54	5.6	5.9	1.6	0.1	0.84	0.80	4.8	1.7	0.4	1.15	0.10	1.66
ORP (mV)	201	116	175	162	156	34.4	262.0	51	56	148	45	24.8	-28.6	198.2
Turbidity (NTU)	27.0	1.5	6.0	22.0	0.0	0.2	0	0.0	1.3	2.0	0.0	0.0	2.2	2.8
Iron II (mg/L)	ND	ND	ND	NS	ND	0	0	NS	NS	NS	NS	NS	0.4	0
Geochemical Natural Attenuation Parameters (mg/L)														
Total Organic Carbon++	16	9	7	<1	9	2 JB	2	NS	NS	NS	NS	NS	1 JB	1
Chloride	23.9	15.2	27.9	43.1	37.2	30.3 JB (DF = 5)	33.7	NS	NS	NS	NS	NS	75.8	85.5
Nitrate	<0.5	<0.5 R	<0.5	<0.5	<0.5	<0.50	<0.50	NS	NS	NS	NS	NS	<0.50	<0.50
Sulfate	153	76.8	76.6	71.7	57.9	65.5 JB (DF = 5)	68.6	NS	NS	NS	NS	NS	51.3 (DF = 2)	47.5
Total Alkalinity	370	450	340	260	270	250	260	NS	NS	NS	NS	NS	210	220
Total Sulfide	<0.5	<1	<1	<1	<1	<1.0	<1.0	NS	NS	NS	NS	NS	<1.0	<1.0
Carbon Dioxide	24	15	7.1	6.86	7.5	12	8.1	NS	NS	NS	NS	NS	5.4	4.3
Methane	0.002	0.001	0.004	0.001	0.0021	0.0027	0.0016	NS	NS	NS	NS	NS	<0.0010	<0.0010
Ethylene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	NS	NS	NS	NS	NS	0.0011	<0.0010
Hydrogen (nmol/L)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Note:

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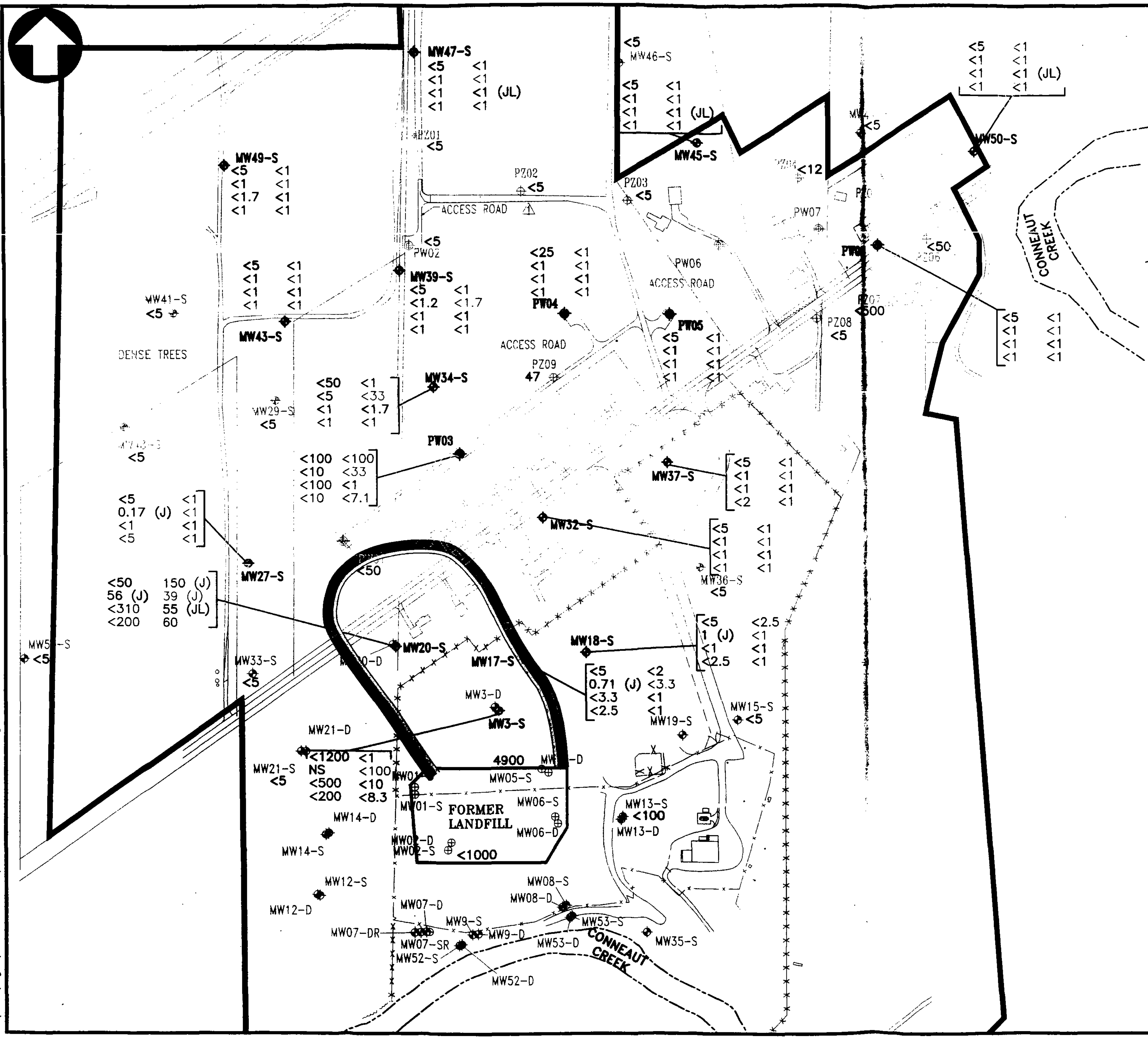
++ Prior to Feb-03, samples analyzed for dissolved organic carbon
1.92 = suspect data
VOC Concentrations in **bold** are those that were detected at concentrations greater than the reporting limit.

Courtesy of: Olin Corporation
Prepared By: SRG 09/08/2003
Checked By: AWE 09/09/2003
Modified by Ohio EPA on 6/14/04

ATTACHMENT A

MNA Plume Maps and Draft Concentration vs. Time Line Graphs
(Courtesy of Olin Corp.)



LEGEND

	PIEZOMETER LOCATION
◆	MONITORING WELL LOCATION
◆	FORMER PUMPING WELL LOCATION (CURRENTLY SERVES AS A MONITORING WELL)
MW17-S	MONITORED NATURAL ATTENUATION (MNA) SAMPLING LOCATIONS
	OUTLINE OF DEED RESTRICTED AND OLIN OWNED PROPERTY
	CREEK
	FENCE
	PROPERTY
J	DETECTED ABOVE THE INSTRUMENT DETECTION LEVEL BUT LESS THAN THE REPORTING LIMIT (ESTIMATED)
<	NOT DETECTED ABOVE REPORTING LIMIT SHOWN
JL	DETECTED ABOVE THE INSTRUMENT DETECTION LEVEL BUT LESS THAN THE REPORTING LIMIT (ESTIMATED), BIASED LOW
NS	NOT SAMPLED
µg/L	MICROGRAMS PER LITER
PCE	TETRACHLOROETHENE

PCE MCL = 5.0 g/L µ

PLUMES FOR 1997, 2000, 2002, AND 2003 DEPICT THE AREA FOR WHICH THE GROUNDWATER CLEANUP GOAL WAS EXCEEDED

- JUNE 1997 PLUME AND SAMPLING EVENT (PUMP AND TREAT)
- MARCH 2000 PLUME AND SAMPLING EVENT
- SEPTEMBER 2000 SAMPLING EVENT
- MARCH 2001 SAMPLING EVENT
- SEPTEMBER/OCTOBER 2001 SAMPLING EVENT
- JUNE 2002 PLUME AND SAMPLING EVENT
- FEBRUARY 2003 PLUME AND SAMPLING EVENT
- AUGUST 2003 PLUME AND SAMPLING EVENT

SCALE IN FEET

0 300 600

TETRACHLOROETHENE (µg/L) COMPARISON OF PLUME PRIOR TO AND DURING THE DEMONSTRATION PERIOD 2000 THROUGH 2003

JOB NO. 6300-03-0009

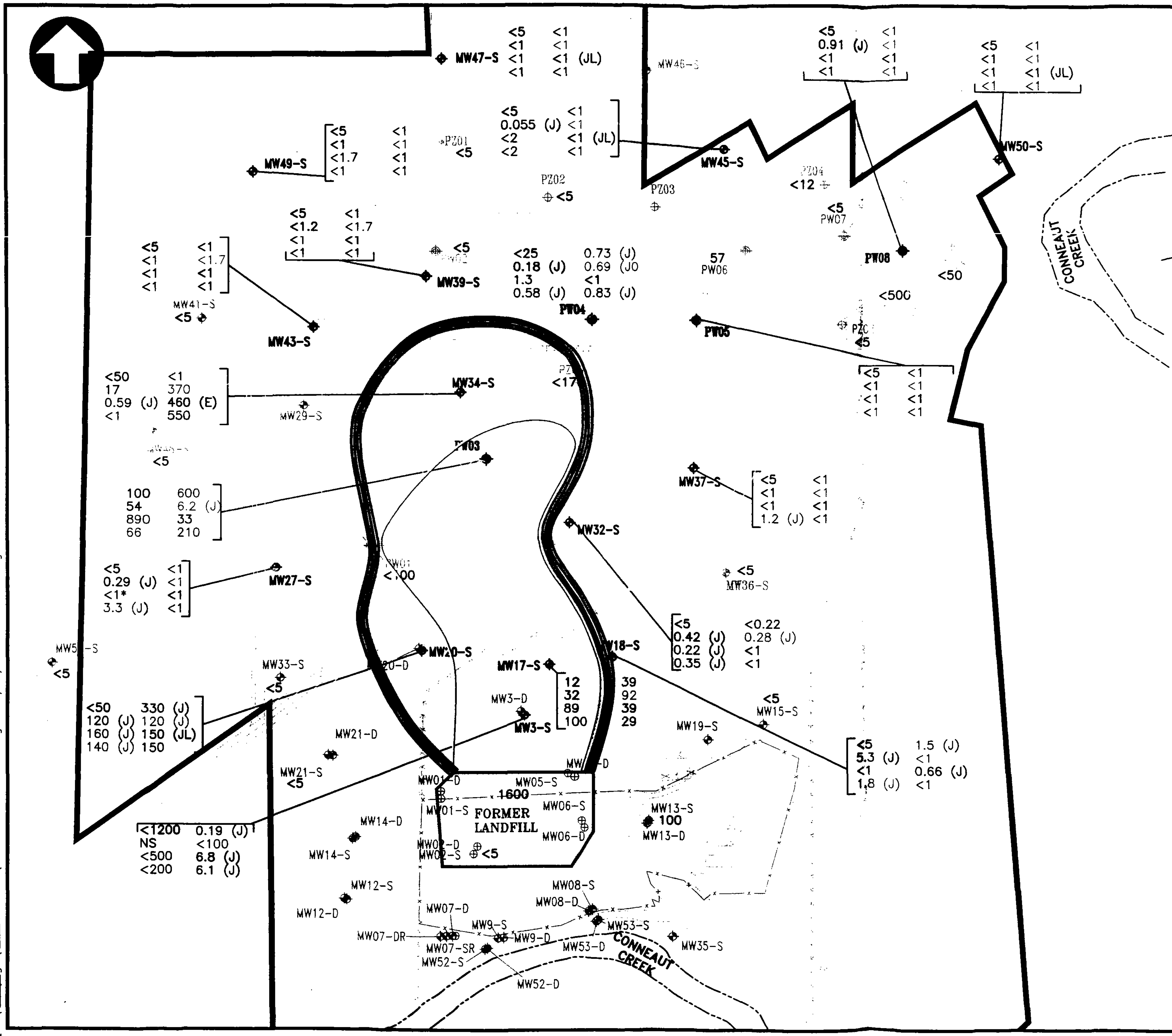
FIGURE 5

MACTEC
Mactec Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

OLIN CORPORATION
OLIN BIG D CAMPGROUND
6300-03-0009

PREPARED BY/DATE

CHECKED BY/DATE



LEGEND

- PIEZOMETER LOCATION
- ◆ MONITORING WELL LOCATION
- ◆ FORMER PUMPING WELL LOCATION (CURRENTLY SERVES AS A MONITORING WELL)
- MW-17S MONITORED NATURAL ATTENUATION (MNA) SAMPLING LOCATIONS
- OUTLINE OF DEED RESTRICTED AND OLIN OWNED PROPERTY
- CREEK
- FENCE
- PROPERTY
- J DETECTED ABOVE THE INSTRUMENT DETECTION LEVEL BUT LESS THAN THE REPORTING LIMIT (ESTIMATED)
- < NOT DETECTED ABOVE REPORTING LIMIT SHOWN
- JL DETECTED ABOVE THE INSTRUMENT DETECTION LEVEL BUT LESS THAN THE REPORTING LIMIT (ESTIMATED), BIASED LOW
- NS NOT SAMPLED
- μg/L MICROGRAMS PER LITER
- E ESTIMATED RESULT BECAUSE THE CONCENTRATION EXCEEDS THE INSTRUMENT CALIBRATION RANGE
- * SAMPLE COLLECTED 12/11/00
- TCE TRICHLOROETHYLENE

TCE MCL = 5.0 μg/L

PLUMES FOR 1997, 2000, 2002, AND 2003 DEPICT THE AREA FOR WHICH THE GROUNDWATER CLEANUP GOAL WAS EXCEEDED

- JUNE 1997 PLUME AND SAMPLING EVENT (PUMP AND TREAT)
- MARCH 2000 PLUME AND SAMPLING EVENT
- SEPTEMBER 2000 SAMPLING EVENT
- MARCH 2001 SAMPLING EVENT
- SEPTEMBER/OCTOBER 2001 SAMPLING EVENT
- JUNE 2002 PLUME AND SAMPLING EVENT
- FEBRUARY 2003 PLUME AND SAMPLING EVENT
- AUGUST 2003 PLUME AND SAMPLING EVENT

SCALE IN FEET

0 300 600

TRICHLOROETHYLENE (μg/L) COMPARISON OF PLUME PRIOR TO AND DURING THE DEMONSTRATION PERIOD 2000 THROUGH 2003

FIGURE 6

JOB NO. 6300-03-0009

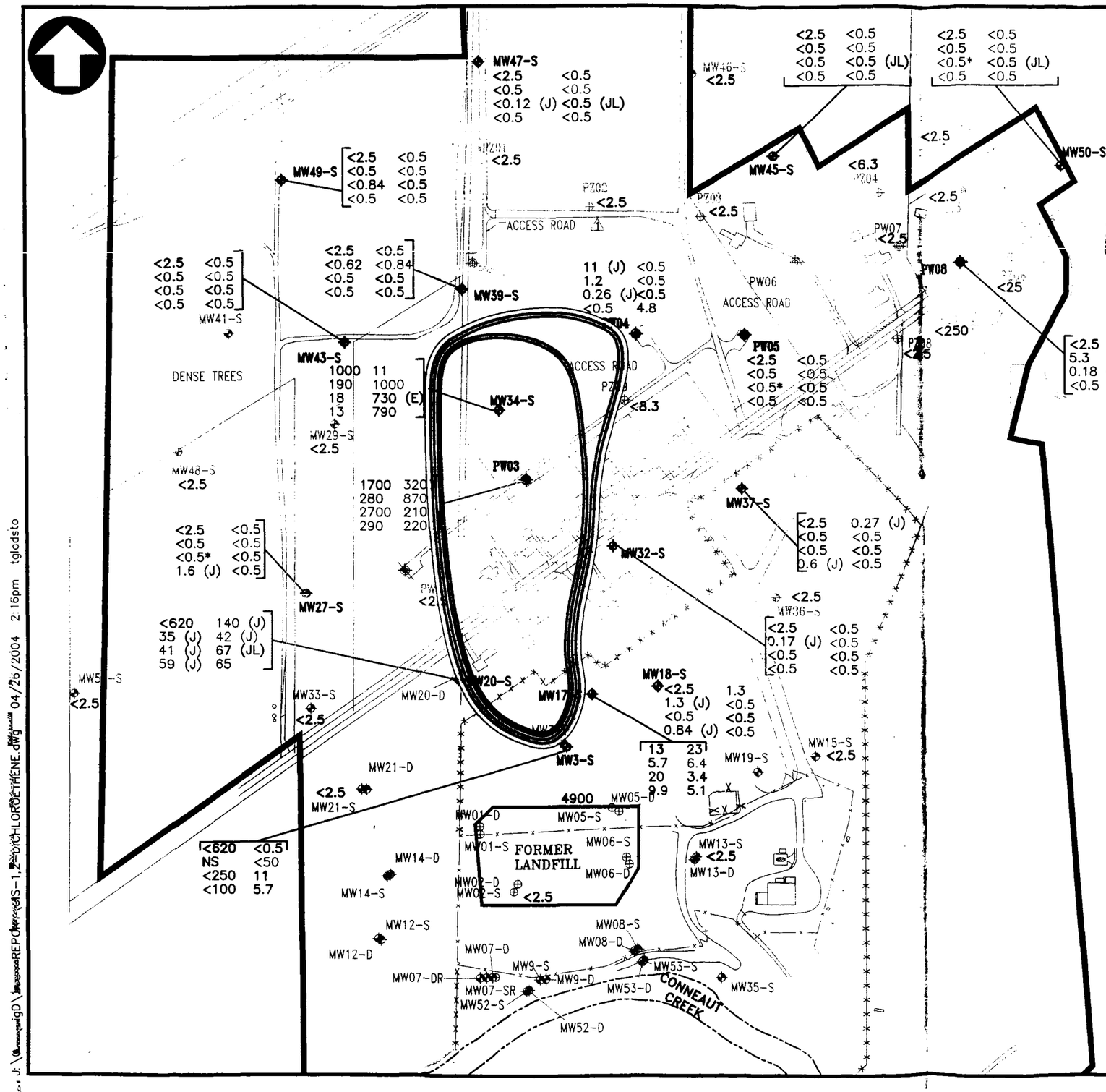
MACTEC
Mactec Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

OLIN CORPORATION
OLIN BIG D CAMPGROUND
6300-03-0009

CHECKED BY/DATE

PREPARED BY/DATE

J:\[redacted]gD\[redacted]REPO[redacted]ICHLOROETHYLENE.dwg 04/26/2004 11:26am tgladsto



LEGEND

- PIEZOMETER LOCATION
- MONITORING WELL LOCATION
- FORMER PUMPING WELL LOCATION (CURRENTLY SERVES AS A MONITORING WELL)
- MW17-S — MONITORED NATURAL ATTENUATION (MNA) SAMPLING LOCATIONS
- OUTLINE OF DEED RESTRICTED AND OLIN OWNED PROPERTY
- CREEK
- FENCE
- PROPERTY
- J — DETECTED ABOVE THE INSTRUMENT DETECTION LEVEL BUT LESS THAN THE REPORTING LIMIT (ESTIMATED)
- < — NOT DETECTED ABOVE REPORTING LIMIT SHOWN
- JL — DETECTED ABOVE THE INSTRUMENT DETECTION LEVEL BUT LESS THAN THE REPORTING LIMIT (ESTIMATED), BIASED LOW
- NS — NOT SAMPLED
- µg/L — MICROGRAMS PER LITER
- E — ESTIMATED RESULT BECAUSE THE CONCENTRATION EXCEEDS THE INSTRUMENT CALIBRATION RANGE
- * — SAMPLE COLLECTED 12/11/00
- DCE — DICHLOROETHYLENE

CIS-12--DCE MCL = 70 µg/L

PLUMES FOR 1997, 2000, 2002, AND 2003 DEPICT THE AREA FOR WHICH THE GROUNDWATER CLEANUP GOAL WAS EXCEEDED

- JUNE 1997 PLUME AND SAMPLING EVENT (PUMP AND TREAT)
- MARCH 2000 PLUME AND SAMPLING EVENT
- SEPTEMBER 2000 SAMPLING EVENT
- MARCH 2001 SAMPLING EVENT
- SEPTEMBER/OCTOBER 2001 SAMPLING EVENT
- JUNE 2002 PLUME AND SAMPLING EVENT
- FEBRUARY 2003 PLUME AND SAMPLING EVENT
- AUGUST 2003 PLUME AND SAMPLING EVENT

SCALE IN FEET

0 300 600

CIS-1,2-DICHLOROETHENE (µg/L)
COMPARISON OF PLUME PRIOR TO AND DURING THE DEMONSTRATION PERIOD
2000 THROUGH 2003

FIGURE 7

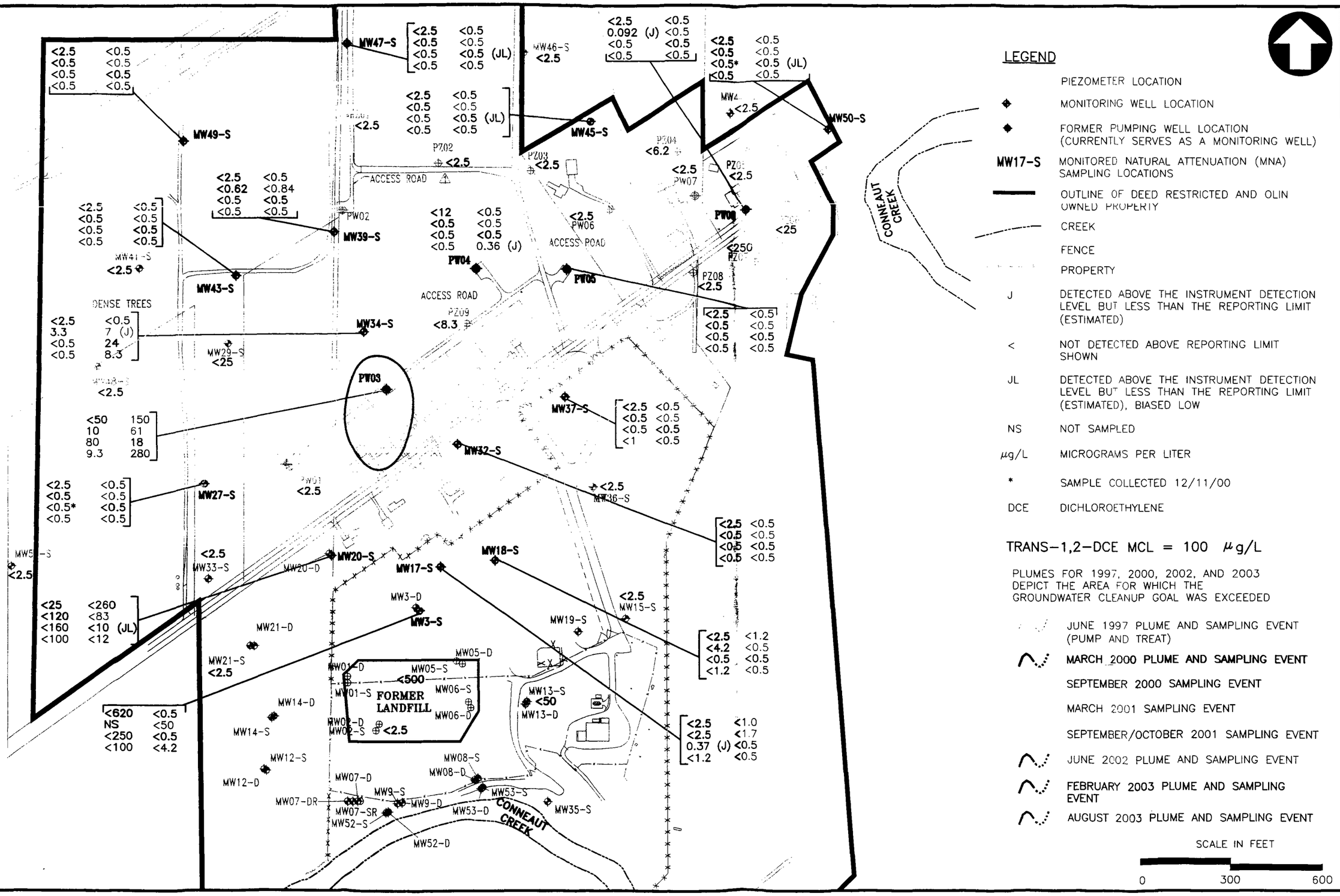
JOB NO. 6300-03-0009

MACTEC
Mactec Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

OLIN CORPORATION
OLIN BIG D CAMPGROUND
6300-03-0009

PREPARED BY/DATE

CHECKED BY/DATE



LEGEND

- PIEZOMETER LOCATION
- MONITORING WELL LOCATION
- FORMER PUMPING WELL LOCATION (CURRENTLY SERVES AS A MONITORING WELL)
- MW17-S — MONITORED NATURAL ATTENUATION (MNA) SAMPLING LOCATIONS
- OUTLINE OF DEED RESTRICTED AND OLIN OWNED PROPERTY
- CREEK
- FENCE
- PROPERTY
- J — DETECTED ABOVE THE INSTRUMENT DETECTION LEVEL BUT LESS THAN THE REPORTING LIMIT (ESTIMATED)
- < — NOT DETECTED ABOVE REPORTING LIMIT SHOWN
- JL — DETECTED ABOVE THE INSTRUMENT DETECTION LEVEL BUT LESS THAN THE REPORTING LIMIT (ESTIMATED), BIASED LOW
- NS — NOT SAMPLED
- µg/L — MICROGRAMS PER LITER
- * — SAMPLE COLLECTED 12/11/00
- DCE — DICHLOROETHYLENE

TRANS-1,2-DCE MCL = 100 µg/L

PLUMES FOR 1997, 2000, 2002, AND 2003 DEPICT THE AREA FOR WHICH THE GROUNDWATER CLEANUP GOAL WAS EXCEEDED

- JUNE 1997 PLUME AND SAMPLING EVENT (PUMP AND TREAT)
- MARCH 2000 PLUME AND SAMPLING EVENT
- SEPTEMBER 2000 SAMPLING EVENT
- MARCH 2001 SAMPLING EVENT
- SEPTEMBER/OCTOBER 2001 SAMPLING EVENT
- JUNE 2002 PLUME AND SAMPLING EVENT
- FEBRUARY 2003 PLUME AND SAMPLING EVENT
- AUGUST 2003 PLUME AND SAMPLING EVENT

SCALE IN FEET

0 300 600

TRANS-1,2-DICHLOROETHYLENE (µg/L)
COMPARISON OF PLUME PRIOR TO AND DURING THE DEMONSTRATION PERIOD
20CO THROUGH 2003

JOB NO. 6300-03-0009 FIGURE 8

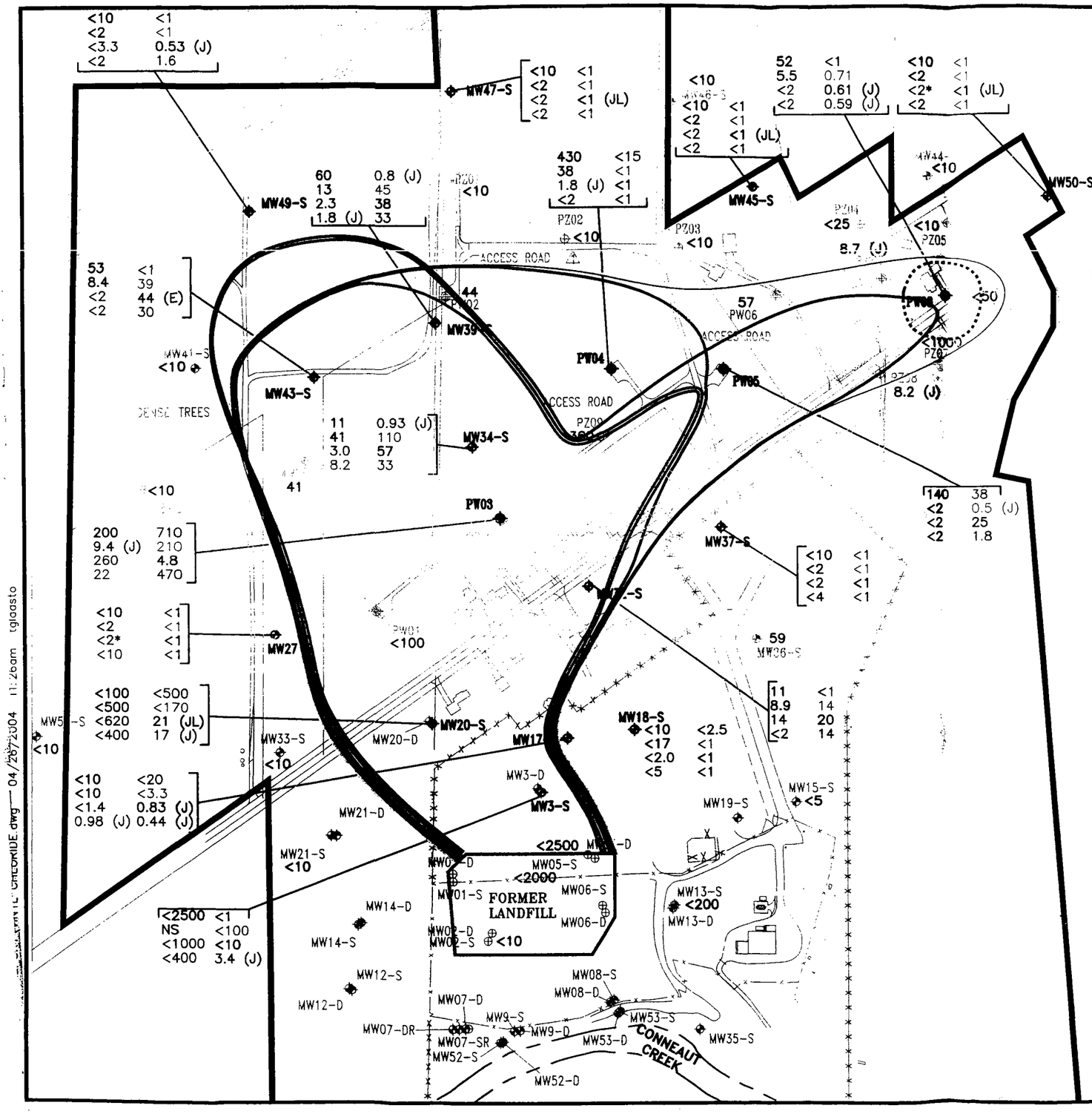
MACTEC
Mactec Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

OLIN CORPORATION
OLIN BIG D CAMPGROUND
6300-03-0009

PREPARED BY/DATE

CHECKED BY/DATE

J:\Olin\BigD\2003\REPORT\TRANS-1,2-DICHLOROETHYLENE.dwg 04/26/2004 11:27am tgladsto



VINYL CHLORIDE (µg/L)
COMPARISON OF PLUME PRIOR TO AND DURING THE DEMONSTRATION PERIOD 2000 THROUGH 2003

FIGURE 9

JOB NO. 6300-03-0009

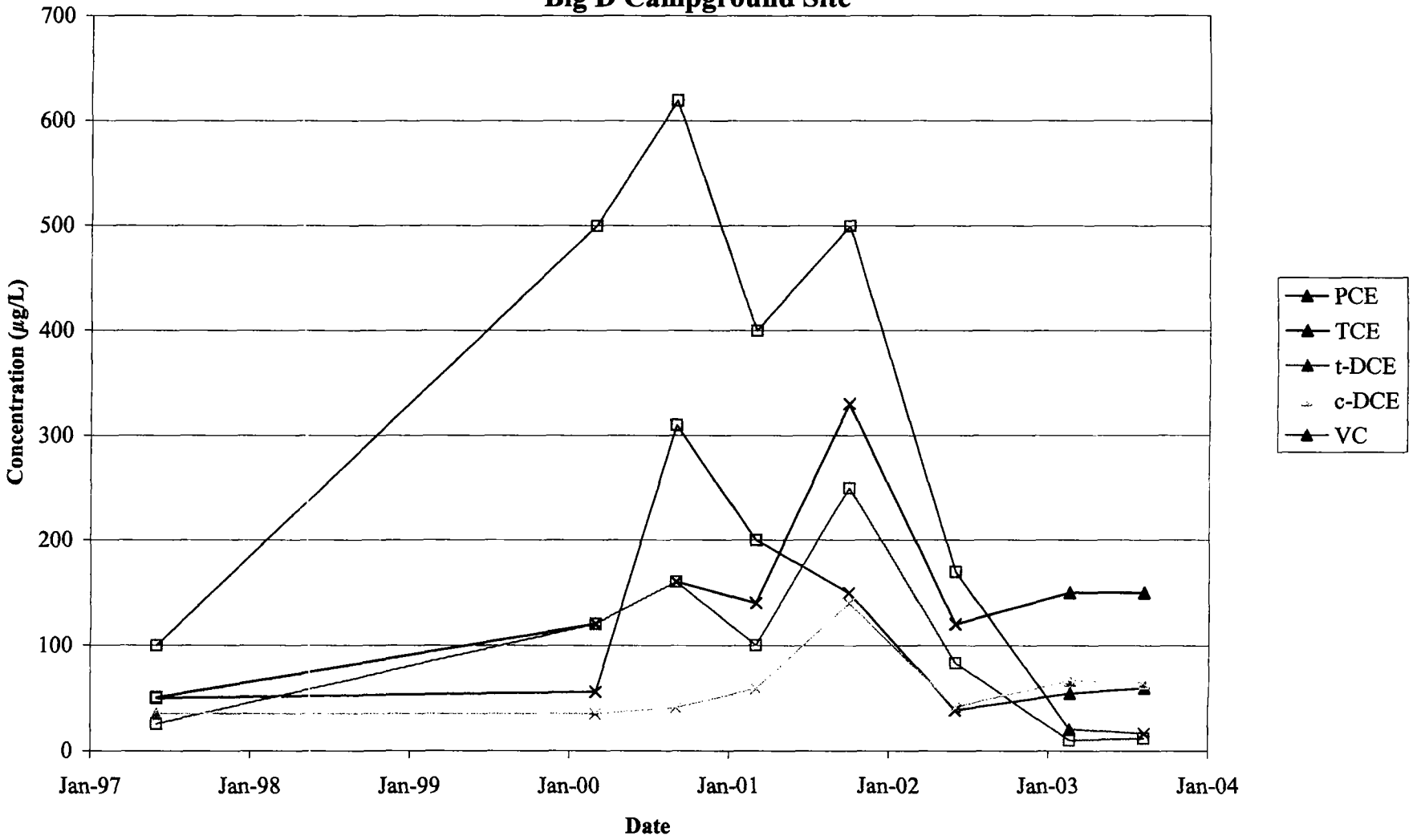
MACTEC
Mactec Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

OLIN CORPORATION
OLIN BIG D CAMPGROUND
6300-03-0009

PREPARED BY/DATE

CHECKED BY/DATE

MNA Constituents with Time in MW-20S
Big D Campground Site



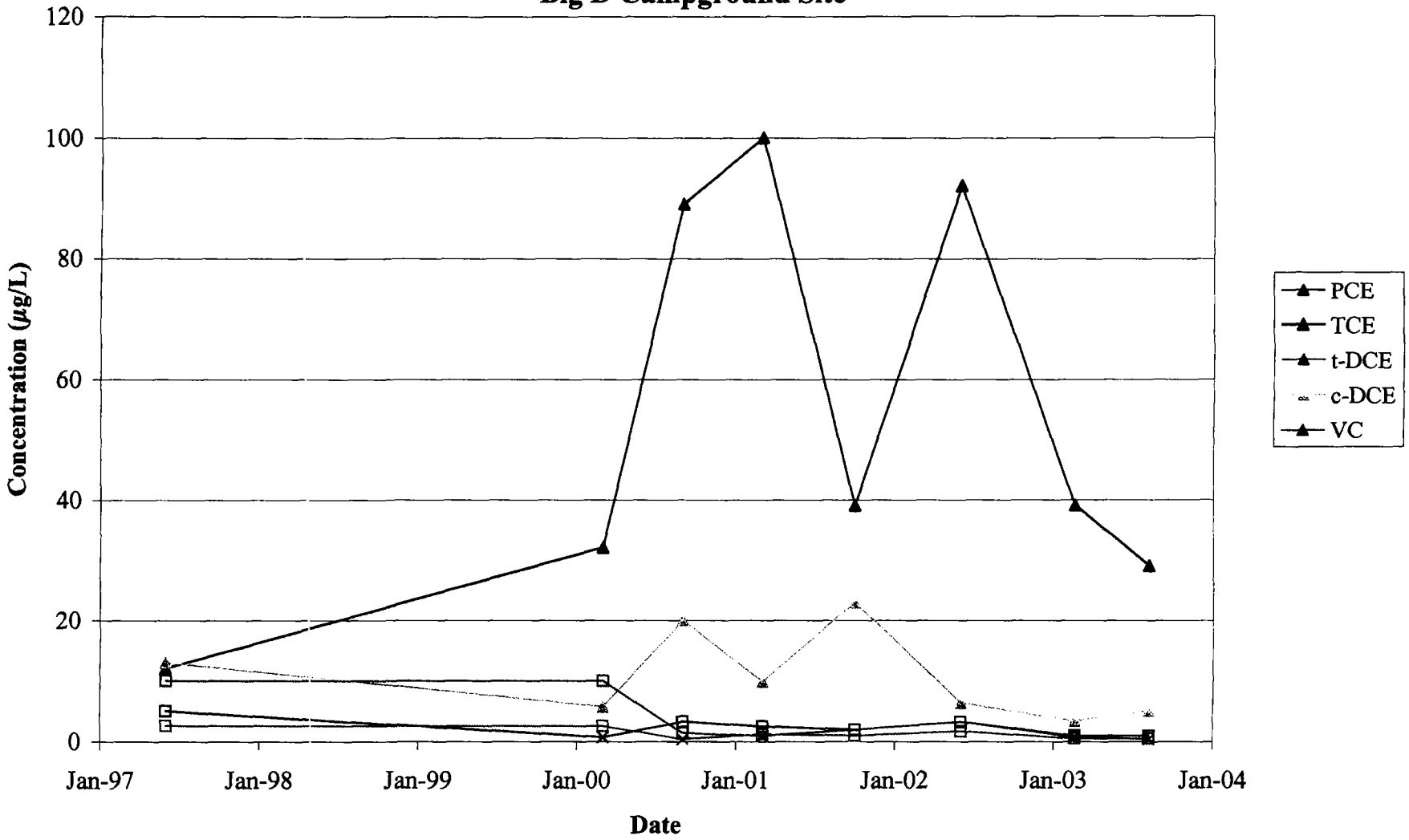
▲ - Value above reporting limit

□ - Constituent not detected (value shown is laboratory detection limit)

× - Value above detection limit but below laboratory reporting limit

Prepared by: SRG 6/1/04
Checked by: AWE 6/2/04

MNA Constituents with Time in M-17S
Big D Campground Site



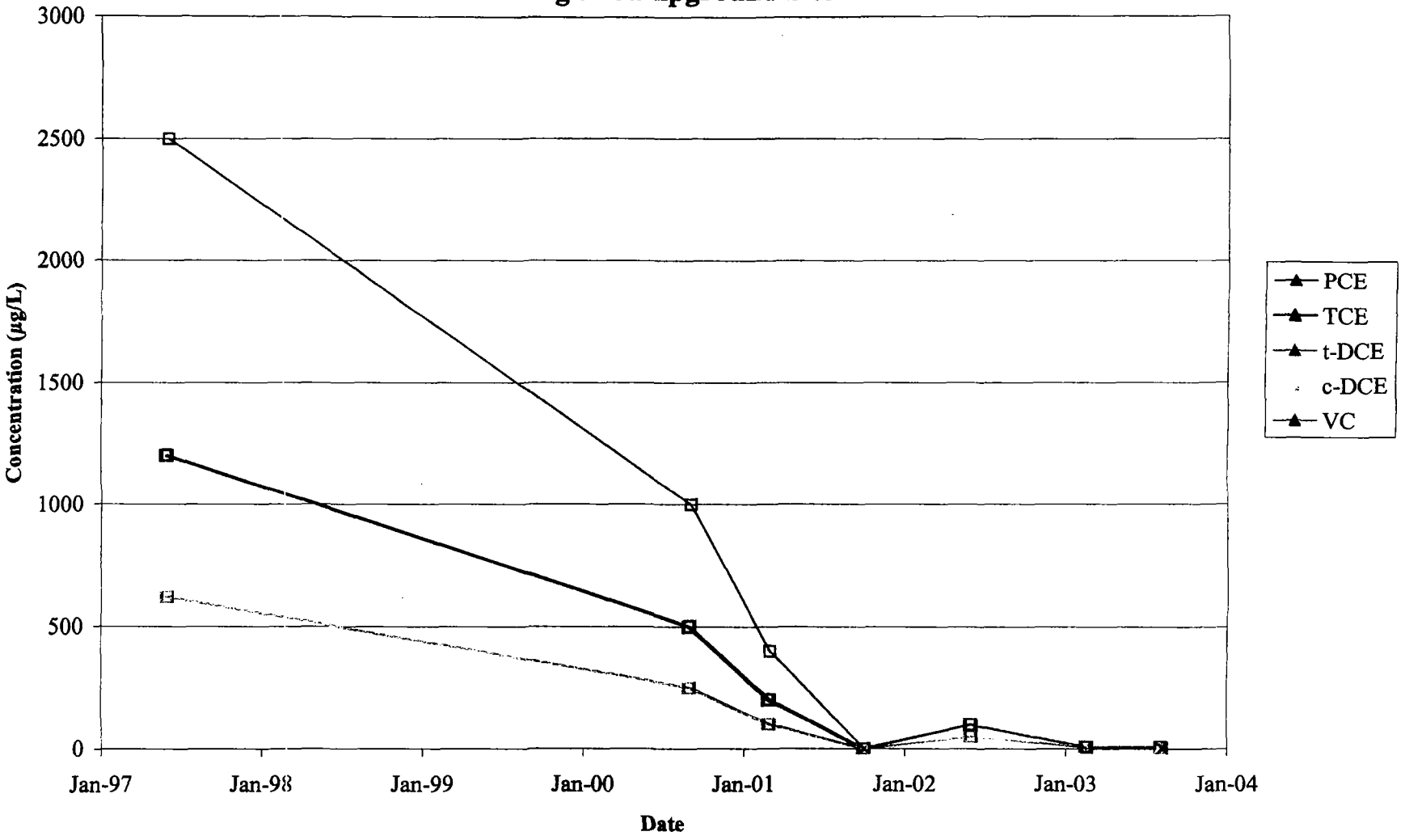
▲ - Value above reporting limit

□ - Constituent not detected (value shown is laboratory detection limit)

× - Value above detection limit but below laboratory reporting limit

Prepared by: SRG 6/1/04
Checked by: AWE 6/2/04

MNA Constituents with Time in MW-3S
Big D Campground Site



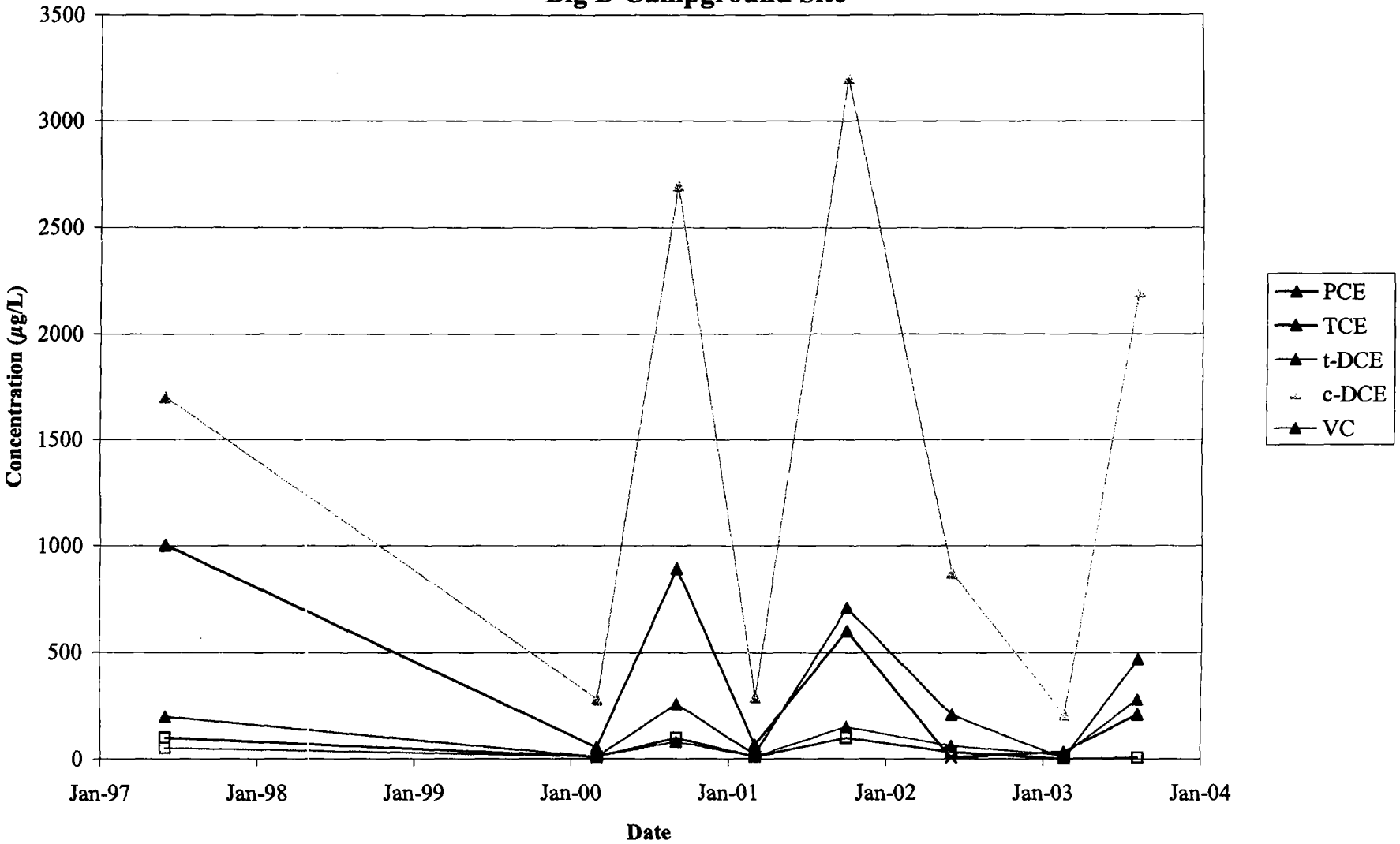
▲ - Value above reporting limit

□ - Constituent not detected (value shown is laboratory detection limit)

× - Value above detection limit but below laboratory reporting limit

Prepared by: SRG 6/1/04
Checked by: AWE 6/2/04

MNA Constituents with Time in PW-03
Big D Campground Site



▲ - Value above reporting limit

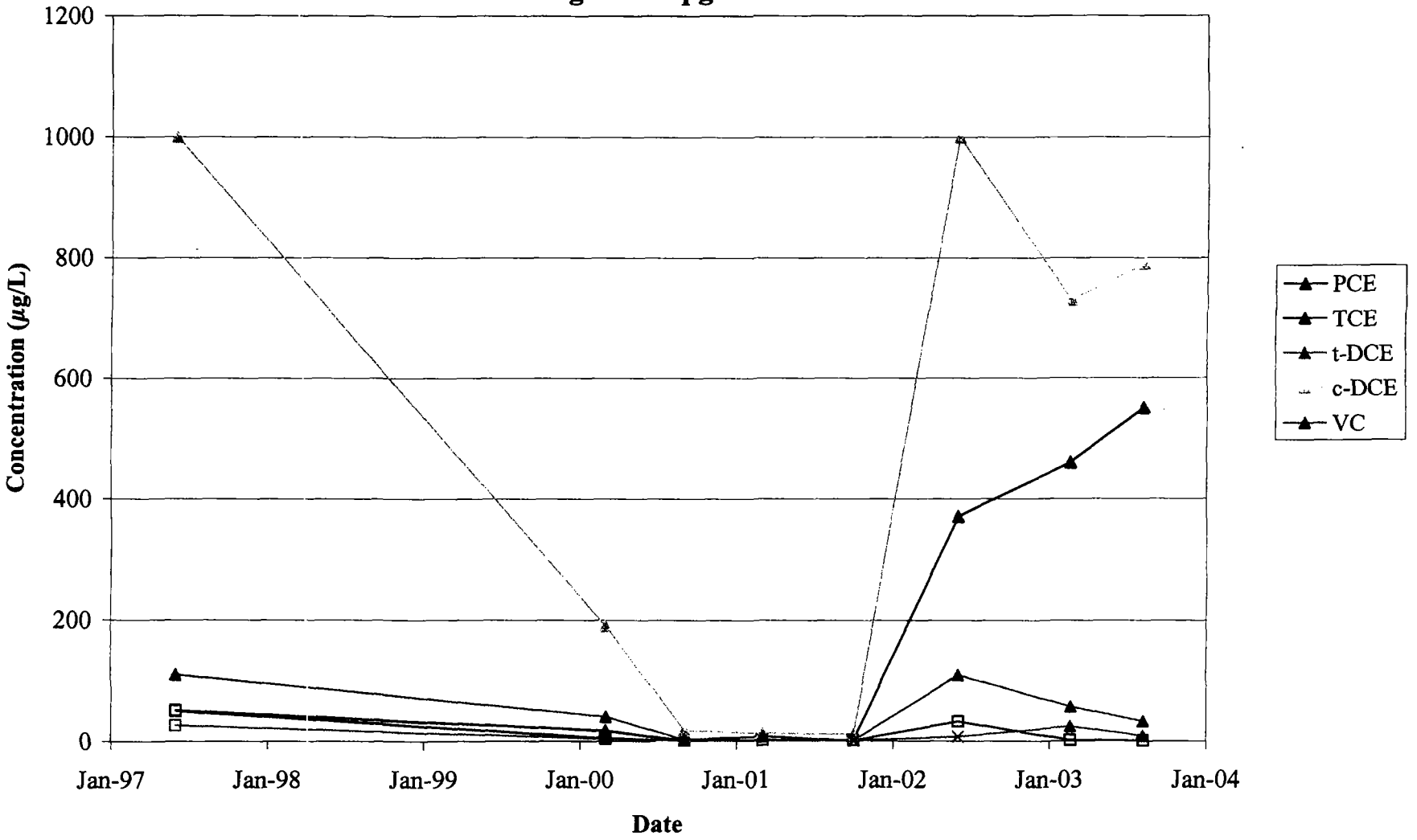
□ - Constituent not detected (value shown is laboratory detection limit)

× - Value above detection limit but below laboratory reporting limit

Prepared by: SRG 6/1/04
Checked by: AWE 6/2/04

DRAFT

MNA Constituents with Time in MW-34S
Big D Campground Site



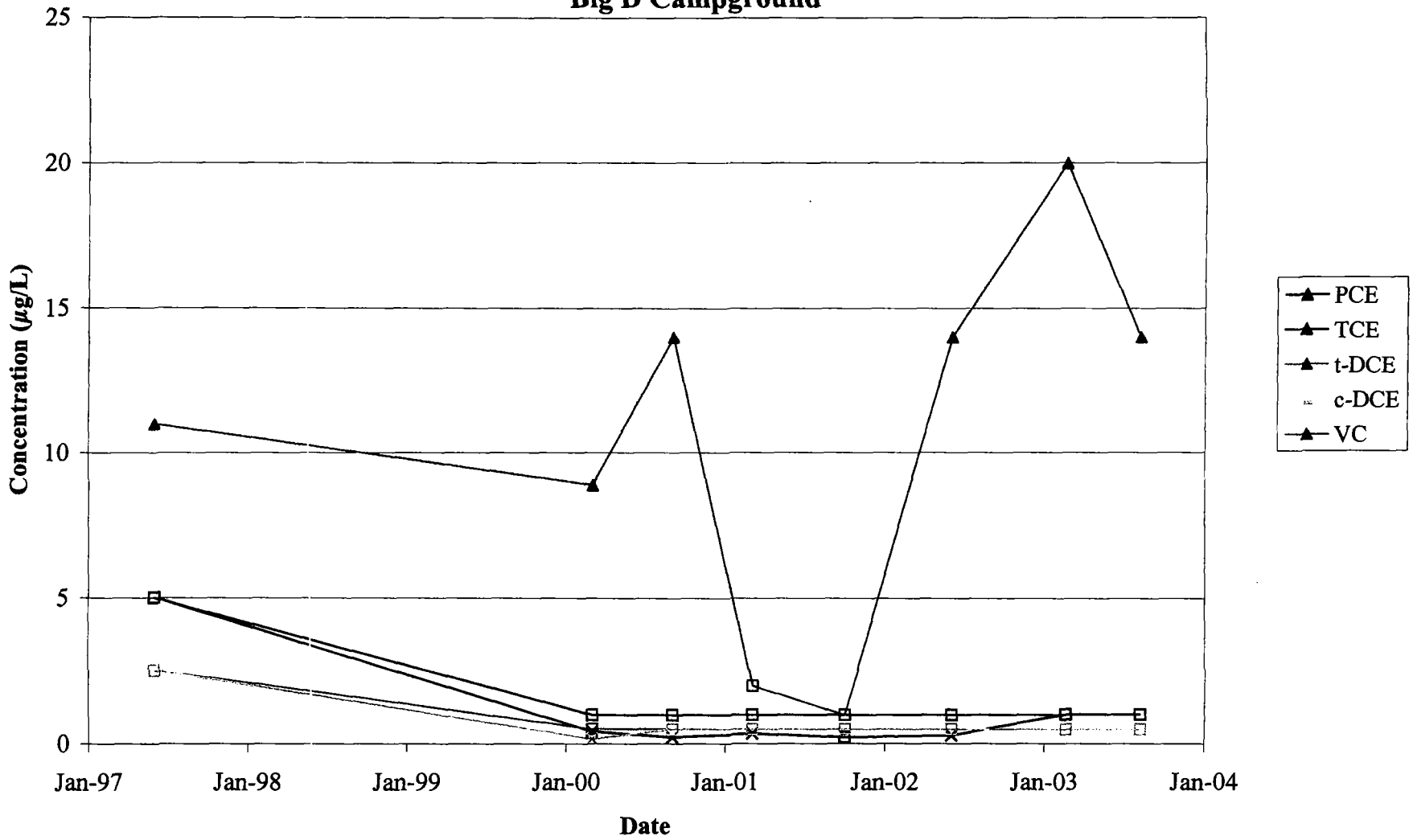
▲ - Value above reporting limit

□ - Constituent not detected (value shown is laboratory detection limit)

× - Value above detection limit but below laboratory reporting limit

Prepared by: SRG 6/1/04
Checked by: AWE 6/2/04

MNA Constituents with Time in MW-32S
Big D Campground



▲ - Value above reporting limit

□ - Constituent not detected (value shown is laboratory detection limit)

× - Value above detection limit but below laboratory reporting limit

Prepared by: SRG 6/1/04
Checked by: AWE 6/2/04

ATTACHMENT B

Site Inspection Sheets / Questionnaires

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program..

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: Big O Campground	**Date of inspection:** April 27th, 2004
Location and Region: Ashtabula Co., Ohio	**EPA ID:** OHD980611235
Agency, office, or company leading the five-year review: Ohio EPA	**Weather/temperature:**

Follow-up visit conducted 6/2/04

Remedy Includes: (Check all that apply)

- X Landfill cover/containment
- X Access controls
- X Institutional controls
- G Groundwater pump and treatment – In part
- G Surface water collection and treatment
- G Other _____
- X Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. O&M ~~site manager~~ Project Principle — Cynthia Draper (Name) — Project Principle - Matec (Title) — 4/27/04 (Date)
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached Continued Monitoring recommended

2. O&M ~~Project staff~~ Project manager — Jamie Cashwell (Name) — project manager - Matec (Title) — 4/27/04 (Date)
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached Makes site, continue monitoring, recommended

Site Inspection Personell - 4/27/04

Name	Agency/Company
Andrew Kocher	Ohio EPA
HOWARD CAINE	US EPA
James Cashwell	MACTEC Engineering & Consulting
Bob Kay	USEPA
Cynthia E. Draper	MACTEC
Raymond J Horn	Olin Corp.

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

	Name	Title	Date	Phone no.
Agency U.S. EPA Contact	Howard Cairo	RPM	4/27/04	

Problems; suggestions; G Report attached No (New RPM)

	Name	Title	Date	Phone no.
Agency U.S. EPA Contact	Bob Kay	Hydrogeologist	4/27/04	

Problems; suggestions; G Report attached NO

	Name	Title	Date	Phone no.
Agency Contact				

Problems; suggestions; G Report attached

	Name	Title	Date	Phone no.
Agency Contact				

Problems; suggestions; G Report attached

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - (G) O&M manual 1994 — (G) Readily available — G Up to date — G N/A
   - (G) As-built drawings 1994 — G Readily available — G Up to date — G N/A
   - (G) Maintenance logs 1994 — G Readily available — G Up to date — G N/A

   Remarks: Most documents were current up to 1994, Documents created after shutdown of plant have not been kept in the plant. On follow-up visit on 6/2/04 all current documents were on site and in a separate section

2. **Site-Specific Health and Safety Plan** — (G) Readily available 1998 — G Up to date — G N/A
   - G Contingency plan/emergency response plan — G Readily available — G Up to date — G N/A

   Remarks: Contingency Plan will get. See #1 Remarks

3. **O&M and OSHA Training Records** — G Readily available — G Up to date — G N/A

   Remarks: 1994 → will get. See #1 Remarks

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — G N/A
   - G Effluent discharge — G Readily available — G Up to date — G N/A
   - G Waste disposal, POTW — G Readily available — G Up to date — G N/A
   - G Other permits _____ — G Readily available — G Up to date — G N/A

   Remarks: Treatment Plant shut down, no permits needed

5. **Gas Generation Records** — G Readily available — G Up to date — G N/A

   Remarks: ~~Note~~ Delisted ash landfill no gas

6. **Settlement Monument Records** — G Readily available — G Up to date — G N/A

   Remarks: Shown on drawings of As-Built report

7. **Groundwater Monitoring Records** — G Readily available — G Up to date — (G) N/A

   Remarks: GW records are not kept here, at Charleston Team. See #1 Remarks

8. **Leachate Extraction Records** — G Readily available — G Up to date — (G) N/A

   Remarks: Shut down. See #1 Remarks

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — G N/A
   - G Water (effluent) — G Readily available — G Up to date — G N/A

   Remarks: Shut down

10. **Daily Access/Security Logs** — G Readily available — G Up to date — G N/A

    Remarks: will get sign in sheet. On follow-up visit on 6/2/04, a sign in sheet was brought

IV. O&M COSTS

1. **O&M Organization**
   - G State in-house
   - G Contractor for State
   - (G) PRP in-house
   - G Contractor for PRP
   - G Federal Facility in-house
   - G Contractor for Federal Facility
   - G Other

2. **O&M Cost Records** ~ Charleston
   - (G) Readily available n/a
   - G Up to date
   - G Funding mechanism/agreement in place

   Original O&M cost estimate 13 million G Breakdown attached – 1994

   Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
	1995	$1,076,000	G Breakdown attached
	2003	$164,000	G Breakdown attached
			G Breakdown attached
			G Breakdown attached
			G Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: No

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** (G) Location shown on site map G Gates secured G N/A
   Remarks Two crawl space on south fence behind treatment plant

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map (G) N/A
   Remarks Good Condition

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented G Yes (G) No G N/A
Site conditions imply ICs not being fully enforced G Yes (G) No G N/A

Type of monitoring (*e.g.*, self-reporting, (drive by)) _____
Frequency 2 times a year
Responsible party/agency PRP
Contact Ray Korn _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date No report required G Yes G No (G) N/A
Reports are verified by the lead agency If problem, will report G Yes G No (G) N/A

Specific requirements in deed or decision documents have been met (G) Yes G No G N/A
Violations have been reported None to report G Yes G No (G) N/A
Other problems or suggestions: G Report attached
No

2. **Adequacy** (G) ICs are adequate G ICs are inadequate G N/A
Remarks Continued

D. General

1. **Vandalism/trespassing** G Location shown on site map (G) No vandalism evident
Remarks

2. **Land use changes on site** G N/A
Remarks ND

3. **Land use changes off site** G N/A
Remarks Mr. Buckmaster house with near landfill

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map (G) Roads adequate G N/A
Remarks well maintained

B. Other Site Conditions

Remarks well installed, secured

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map (G) Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** G Location shown on site map (G) Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** G Location shown on site map (G) Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** G Location shown on site map (G) Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** (G) Grass (G) Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** (G) N/A
   Remarks_____

7. **Bulges** G Location shown on site map (G) Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** (G) Wet areas/water damage not evident
   - G Wet areas — G Location shown on site map — Areal extent_____
   - G Ponding — G Location shown on site map — Areal extent_____
   - G Seeps — G Location shown on site map — Areal extent_____
   - G Soft subgrade — G Location shown on site map — Areal extent_____

   Remarks_____

9. **Slope Instability** G Slides G Location shown on site map (G) No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches G Applicable G N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map (G) N/A or okay
   Remarks_____

2. **Bench Breached** G Location shown on site map (G) N/A or okay
   Remarks_____

3. **Bench Overtopped** G Location shown on site map (G) N/A or okay
   Remarks_____

C. Letdown Channels (G) Applicable G N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map (G) No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** G Location shown on site map (G) No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** G Location shown on site map (G) No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** G Location shown on site map (G) No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ (G) No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
(G) Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
(G) N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance (G) N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
(G) Properly secured/lockedG Functioning G Routinely sampled (G) Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
(G) Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed (G) N/A
Remarks_____

E. Gas Collection and Treatment G Applicable (G) N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable (G) N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable (G) N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable (G) N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable G N/A

1. **Siltation** G Location shown on site map (G) Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   (G) Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map (G) Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** (G) Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable (G) N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   (G) Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks Not Heating

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   (G) Good condition G Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   (G) Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable (G) N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks

C. Treatment System G Applicable G N/A Not Operational

1. **Treatment Train** (Check components that apply)
   G Metals removal (G) Oil/water separation out of service G Bioremediation
   (G) Air stripping (G) Carbon adsorbers
   (G) Filters Multi Media Sand Filter
   (G) Additive (*e.g.*, chelation agent, flocculent) HCl
   G Others
   (G) Good condition G Needs Maintenance
   G Sampling ports properly marked and functional NA
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually
   G Quantity of surface water treated annually
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A (G) Good condition G Needs Maintenance
   Remarks

3. **Tanks, Vaults, Storage Vessels**
   G N/A (G) Good condition G Proper secondary containment G Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   G N/A (G) Good condition G Needs Maintenance
   Remarks

5. **Treatment Building(s)**
   G N/A (G) Good condition (esp. roof and doorways) G Needs repair
   (G) Chemicals and equipment properly stored — Fair
   Remarks

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks One manhole used for effluent needs to be bolted down. On follow-up visit on 6/2/09, the manhole was bolted down.

D. Monitoring Data

1. Monitoring Data
   (G) Is routinely submitted on time (G) Is of acceptable quality

2. Monitoring data suggests: Pending presentation
   (G) Groundwater plume is effectively contained (G) Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
(G) Properly secured/locked (G) Functioning (G) Routinely sampled (G) Good condition
(G) All required wells located G Needs Maintenance G N/A
Remarks Did not inspect every well. All wells verified good condition by Matt Pennell

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
As of today, the treatment system is shutdown and the PRP is conducting an MNA Study. The contaminant plume has been stable for the past 4 years with the treatment system shut down. Remedy is functioning as intended.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
No major issues or downtime have been observed. The 2-Year MNA Study has been extended to a 4-Year MNA Study due to lack of data. Plume has been stable. A long or property deed have to be deed restricted then long-term protectiveness remains as far as contact with ground water is concerned.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

Since last 5-Yr Review, MNA Study has been continued.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

- After Two-Year Study ends, if MNA is shown to be occurring, the a decrease from Semi-annual to Annual GW sampling may be possible.
- An addition of electron donors such as Lactate Acid, Molasses, etc. may stimulate quicker degradation of COCs.

BIG D CAMPGROUND
KINGSVILLE, ASHTABULA COUNTY, OHIO

INTERVIEW QUESTIONNAIRE

Instructions: Please answer all the questions. You may write on the back or attach an additional sheet if necessary. Your feedback is very appreciated. Thank You.

Name: Joseph R. Rodebaugh Date: 5/5/04
Address: 3691 Creek Rd.
Kingsville, Ohio 44048

1. **What is your overall impression of the project? (general sentiment)**

2. **What effects have site operations had on the surrounding community or yourself?**

3. **Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.**

4. **Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.**

5. **Do you feel well informed about the site's activities and progress?**

6. **Do you have any comments, suggestions, or recommendations regarding the project (e.g., design, management, regulatory agencies, operations, etc.)?**

The property has been let go to grow up to Brush. What was farm land now is a brush field - it should be kept mowed as was the agreement.

ATTACHMENT C

List of ARARs

Big D Campground Site
Kingsville, Ohio

LIST OF ARARs

This section reviews the applicable or relevant and appropriate requirements (ARARs) for the Big D Campground site. The basis for ARARs is defined in Section 121(d) of CERCLA, as amended by SARA, which requires that remedial actions comply with all applicable or relevant and appropriate federal environmental or promulgated state environmental or facility siting laws.

The "applicable requirements," as defined in 40 Code of Federal Regulations (CFR) 300.5, are "those clean-up standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable." "Relevant and appropriate requirements," also substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws, that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate."

In general, ARARs fall into three categories:

- Chemical-specific requirements: Chemical-specific ARARs specify maximum concentrations of particular chemicals in particular environmental media.

- Location-specific requirements: Location-specific ARARs specify restrictions that have been placed on the concentration of hazardous substances or on the conduct of an activity solely because it occurs in a special location.

- Performance, design or other action-specific requirements: Action-specific ARARs and remediation goals are identified for specific remedial actions.

The ARARs identified at the time that the ROD is signed exerts an enduring influence on the remedy. However, the ARARs are reconsidered to a limited extent during the five-year review.

ARARs in the ROD

Chemical-Specific ARARs

Groundwater: The ROD identified that ground water treatment must comply with chemical specific ARARs for barium (MCL = 1,000 ug/L), chromium (MCL = 50 ug/L), 1,4-dichlorobenzene (MCL = 75 ug/L), trichloroethene (MCL = 5 ug/L), and vinyl chloride (MCL= 2 ug/L).

Surface Water: The ROD identified Ohio Water Quality Standards (OAC 3745-01-03, OAC 3745-01-04, OAC 3745-01-05, OAC 3745-01-07).

Soil: The ROD identified no chemical-specific ARARs for soil.

Sediment: The ROD identified no chemical-specific ARARs for sediment.

Location-Specific ARARs

The ROD identified no location-specific ARARs.

Action-Specific ARARs:

The ROD identified the following action-specific ARARs:

1. Hazardous Waste Management System: General (CFR 260, et.seq.).
2. Resource Conservation and Recovery Act standards applicable to generators of hazardous waste (RCRA Subtitle C 3002, 40 CFR 262).
3. RCRA standards for owners and operators of hazardous waste treatment , storage, and, disposal facilities (RCRA Subtitle C Section 3004, 40 CFR 264 and 265, and Federal Law 71: 3101).
4. Land Disposal Restrictions (RCRA Subtitle C Section 3004, 40 CFR 268).
5. EPA - administered permit programs: The Hazardous Waste Permit Program (RCRA Subtitle C Section 3005, 40 CFR 270 and 124).
6. Standards of Performance for New Stationary Source (Clean Air Act, 40 CFR 60).
7. Safe Drinking Water Act (40 CFR 141 through 143).
8. Clean Water Act (Section 301-308).
9. National Pollutant Discharge Elimination System (Clean Water Act Section 402, 40 CFR 122, 123, 125, and 136).
10. Occupational Safety and Health Act (29 CFR 1910).
11. Ohio Solid and Hazardous Waste Disposal Law (ORC 3734.02 H and ORC 3734.05 C).
12. Ohio Solid Waste Disposal Regulations (OAC 3745-27-02, OAC 3745-27-05, OAC 3745-27-06, OAC 3745-27-07, OAC 3745-27-08, OAC 3745-27-10).
13. Ohio Hazardous Waste Management Regulations (OAC 3745-50 through 3745-69).

14. Ohio Water Quality Standards (OAC 3745-01-03, OAC 3745-01-04, OAC 3745-01-05, OAC 3745-01-07).

15. Ohio Air Pollution Regulations (OAC 3745-15-07 and OAC 3745-15-16).

16. OAC Ohio Particulate Matter Standards 3745-17-02, OAC 3745-17-05, OAC 3745-17-07, OAC 3745-17-09).

17. Ohio Sulfur Dioxide Standards (OAC 3745-18-02, OAC 3745-18-04, OAC 3745-18-06).

18. Ohio Regulations for Carbon Monoxide Photochemically Reactive Materials Hydrocarbons, and related materials (OAC 3745-21-02, OAC 3745-21-03, OAC 3745-21-05, OAC 3745-21-07).

POTENTIAL NEW ARARS

Chemical-Specific ARARs

Ground water: The controlling ARAR for ground water remains MCLs for the COCs present. Metals have been removed form the COC list along with 2,4-Diaminotoluene, 1,2-Dichlorobenzene, 1,4-Dichlorobenzene. No new classes of ARARs for ground water were identified.

Surface Water: The controlling ARARs for surface water remain Ohio Water Quality Standards. No new classes of ARARs for surface water were identified.

Location-Specific ARARs

Due to the concentrations of VOCs and plume location an additional pathway from ground water to indoor is present. The ROD specifies that the general risk for site exposure be below a cancer cumulative risk factor of 10^{-6}.

Action-Specific ARARs

Action-specific ARARs were specified in the ROD for remedial actions previously performed. Because the Five-Year Review does not include any remedial actions, existing action-specific ARARs do not apply and no new ARARs are identified.

ATTACHMENT D

Indoor Air Risk Assessment

OhioEPA
State of Ohio Environmental Protection Agency

Indoor Air Risk Assessment
Big D Campground Site
Kingsville, Ashtabula County
June 15, 2004

During the Five-Year Review Process, Ohio EPA has identified new exposure pathways at the Big D Campground Site located in Kingsville, Ashtabula County, Ohio. One of these pathways is inhalation of indoor air potentially contaminated volatile organic compounds (VOCs). Below is the evaluation of risk from contaminants in subsurface (ground water) volatilizing to indoor air at the Big D Campground Site.

Background:
Vapor intrusion is the movement of volatile chemicals from subsurface contamination into buildings. Contaminated soil or ground water can release volatile chemicals that move into the soil gas above the contaminated zone, through the soil and into overlying buildings. Transfer of vapor into a building can occur by simple diffusion through cracks or seams in subsurface walls and floors, or by convection that may driven by pressure differentials between air inside and outside the building. The potential for vapor intrusion exists in any building that overlies any medium contaminated with volatile chemicals, regardless of the presence or absence of a basement.

Assessment:
The potential for vapor intrusion from contaminated ground water at the Big D Campground Site was evaluated based on current (August 2003) monitoring well data. The maximum historical data were also evaluated, to assess the historic potential for indoor air exposures. The Johnson and Ettinger (J&E 2003, Version 3) Model recommended by U.S. EPA (Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Ground Water and Soils, November 2002) was used to estimate the potential for subsurface vapor intrusion into buildings.

Model Assumptions:
The J&E model is a screening model, and is consequently based on a number of simplified assumptions regarding contaminant distribution and occurrence, subsurface characteristics, transport mechanisms and building construction. The model assumptions used are provided in U.S. EPA's "User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings, June 2003". In general, default assumptions for soil and building parameters were used; please refer to the table (spreadsheet) attached. Specifically, the soil type used was sandy clay (SC); the depth below grade used was 400 cm; residences were assumed to have basements; and residential receptors were assumed to be exposed for 30 years, 350 days/ year. The model may be further refined as site-specific data become available.

Toxicity values:
As recommended in the J&E model, U.S. EPA's Integrated Risk Information System (IRIS) was used as the primary source of the toxicity data. The toxicity values recommended by U.S. EPA's National Center for Environmental Assessment (NCEA) and U.S. EPA's Health Effects Assessment Summary Tables

(HEAST) were secondary sources. In the case of trichloroethylene (TCE), several toxicity values are available. The IRIS TCE toxicity assessment was withdrawn in 1994. U.S. EPA published a draft TCE toxicity assessment in 2001, which is currently undergoing peer review. State peer-reviewed values (California EPA) are also available. The risk associated with all three (3) toxicity values are provided, to provide an estimate of the risks associated with TCE exposures.

Uncertainties:
1. As discussed above, TCE can be assessed in different ways depending on the toxicity values used. The range of results is provided for risk management purposes.

- If TCE is evaluated using the draft 2001 toxicity levels, the current carcinogenic risk from TCE is 5.0E-04 and the current hazard quotient is 2.6E-01; historical high carcinogenic risk is 8.1E-04 and historical high hazard quotient is 4.30E-01.

- If TCE is evaluated using the withdrawn 1994 toxicity values, the current carcinogenic risk from TCE is 1.4E-07 and the historical high carcinogenic risk is 2.30E-07 (no reference concentrations are available to calculate the hazard quotient).

- If TCE is assessed using the California EPA toxicity values, the current carcinogenic risk from TCE is 9.6E-06 and the historical high carcinogenic risk is 1.5E-05. Again, no reference concentrations are available to calculate the hazard quotient.

2. Please note that if the following conditions are noted at the Site, the J&E model is not applicable to assess indoor air exposures. In these situations, direct measurement of indoor air or other media is recommended.

- The presence or suspected presence of residual or free-product nonaqueous phase liquids

- Geologic materials that are fractured, contain macropores or other preferential pathways, or are composed of karst

- Sites where lateral flow of vapors occurs

- Very shallow ground water where the building foundation is vetted by ground water

- Buildings with crawlspace structures or other significant openings to the subsurface (e.g., earthen floors etc.)

- Very small building exchange rates (e.g., <0.25/hr)

- Contaminated ground water sites with large fluctuations in the water table elevations, where the capillary fringe is likely to be contaminated (differs from the assumption in the model that the capillary fringe is uncontaminated)

- Sites with flow rates that vary temporally, and/ or concentrations for which a steady state

assumption is not conservative.

Results:
An estimate of the actual incremental risks to residential receptors associated with the ground water contaminant levels is provided in the (spreadsheet) table, attached. As stated previously, current risk and historically high risk have both been assessed. Both chemical-specific cancer risks and hazard quotients are provided; chemical-specific risks are summed to provide an assessment of total risk. U.S. EPA generally considers acceptable risk to be that within the carcinogenic risk range of 10^{-4} to 10^{-6}, and below the hazard index of 1. At Big D Campground the 1989 Record of Decision states, "...remedial alternatives being considered should be able to reduce total potential carcinogenic risks to levels of 10^{-6} or less."

The risk posed to residents by vapor intrusion from subsurface is above acceptable risk levels at the Big D Campground, based on both the current data and historically high data (see attached table, "Total Indoor Air Risk" columns). Excluding TCE, the risk is driven by exposures to vinyl chloride (current carcinogenic risk of 1.6E-04; historic carcinogenic risk of 2.4E-04). Further evaluation is recommended to assess the risk posed to residents from exposure to contaminated ground water volatilizing to indoor air.

BIG D CAMPGROUND

FIVE-YEAR REVIEW - INDOOR AIR RISK ASSESSMENT

Analyte	Current Results (August 2003) Result (ug/L)	Monitoring Well ID	Current Risk J&E Model 2003 Carcinogenic	Hazard Quotient/ Non-carcinogenic	Historical High Result Result (ug/L)	Monitoring Well ID	Historical Sampling Date	Historical High Risk J&E Model 2003 Carcinogenic	Hazard Quotient/ Non-carcinogenic
Tetrachloroethene (PCE)	60	MW20-S	2.2E-06		150	MW20-S	Sep/Oct 2001	5.40E-06	
Trichloroethylene (TCE)*	550	MW34-S	5.00E-04	2.60E-01	890	PW03	Sep 2000	8.1E-04	4.30E-01
Cis-1,2-Dichloroethylene	2,200	PW03		5.30E-01	8,700	PW03	June 2002		2.1E+00
Trans-1,2-Dichloroethylene	280	PW03		7.30E-02	No historical higher results were detected				7.30E-02
Vinyl Chloride	470	PW03	1.60E-04	4.20E-01	710	PW03	Sep/Oct 2001	2.4E-04	6.30E-01
Monochlorobenzene	7,800	MW20-S		8.20E-01	8,500	MW20-S	Feb 2003		9.00E-01
Total indoor air risk			**6.62E-04**	**2.10E+00**				**1.06E-03**	**4.13E+00**
U.S. EPA's acceptable risk levels for the Big D Campground site in accordance to the 1989 Record of Decision:									
Carcinogenic risk range of 1E-06 and hazard index of 1									
J&E Model inputs used: Default, also specified below									
Soil type: Sandy clay (SC)									
Depth below grade to top of soil contamination: default value of 400 cm used									
(versus estimated site-specific of 366 cm)									
Exposure duration: 30 years (residential)									
Exposure frequency: 350 days (residential)									
N/A: Not Available									
TCE Assessment Uncertainties:									
*TCE was assessed, above, using the new (draft) 2001 toxicity values			5.00E-04	2.60E-01				5.40E-06	N/A
Total indoor air risk (excluding TCE)			**1.6E-04**	**1.84E+00**				**2.45E-04**	**3.70E+00**
If TCE is assessed using the 1994 "withdrawn" toxicity values:									
Trichloroethylene (TCE)	550	MW34-S	1.40E-07	N/A	890	PW03	Sep 2000	2.30E-07	N/A
Total indoor air risk using 1994 TCE value			**1.62E-04**	**1.84E+00**				**2.46E-04**	**3.703**
If TCE is assessed using CalEPA toxicity values:									
Trichloroethylene (TCE)	550	MW34-S	9.10E-06	N/A				1.50E-05	N/A
otal indoor air risk using CalEPA TCE value			**1.71E-04**	**1.84E+00**	890	PW03	Sep 2000	**2.60E-04**	**3.703**

ATTACHMENT E

Deed Restriction Summary
(Courtesy of Olin Corp.)

Big D Campground Deed Restriction Summary

Signatory to Deed Restriction	Current Property Owner	Address	Parcel ID #	Deed Restriction Summary
Baird, James G. & Irene A.	Baird, James G. & Irene A	3740 Creek Road	270060004700	By Agreement entered into on 11/1/93: Owner agreed to no use of groundwater and no excavation below a depth of 20 feet. By Amendment entered into on 6/2/94: Owner agreed to no excavation below 15 feet.
Bruckman, Todd E. & Karen M.	Bruckman, Todd E. & Karen M.	3607 Creek Road 3630 Creek Road	270110002400 270110002401	By Agreement entered into on 6/2/94: Owner agreed to no use of well water and no excavation below a depth of 4 feet. No extraction of groundwater within 500 feet of Olin property line
Dreslinski, Charles A.	Ferl, George	3678 Creek Road	270060004801	By Agreement entered into on 1/19/95: Owner agreed to no use of well water and no excavation below a depth of 12 feet.
English, Barbara (owner) & Porter, Nellie E. (life tenant)	English, Robyn	3780 Creek Road	270070001100	By Agreement entered into on 8/26/93: Owner agreed to no use of well water and no excavation below a depth of 20 feet. By Amendment entered into on 6/2/94: Owner agreed to no excavation below 15 feet.
Fillinger, Marion L.	Tinker, Harold A & Virginia	3661 Creek Road	270060004300	By Agreement entered into on 8/10/93: Owner agreed to no use of well water and no excavation below a depth of 20 feet. By Amendment entered into on 6/2/94: Owner agreed to no excavation below 12 feet.

Big D Campground Deed Restriction Summary

Signatory to Deed Restriction	Current Property Owner	Address	Parcel ID #	Deed Restriction Summary
Girdler, Cynthia K.	Bulfinch, Charles E & Barbara	3681 Creek Road	270060004500	By Agreement entered into on 8/22/93: Owner agreed to no use of well water and no excavation below a depth of 20 feet. By Amendment entered into on 5/16/94: Owner agreed to no excavation below 15 feet.
Gromley, Martha L.	Gromely, Ralph & Ann	3767 Creek Road	270070001300	By Agreement entered into on 8/10/93: Owner agreed to no use of well water and no construction below 2 feet in the easement area and 20 feet elsewhere. By Amendment entered into on 5/6/94: Owner agreed to no excavation below 2 feet in the easement area and 15 feet elsewhere.
Leardi, Vito A. & Jo Ann D.	Howard, Albert & Stern, Dianne	3782 Creek Road	270070001000	By Agreement entered into on 9/8/93: Owner agreed to no use of well water and no excavation below 20 feet. By Amendment entered into on 6/8/94: Owner agreed to no excavation below 15 feet.
McGinnis, Carl & Hazel G.	Ferl, George	3654 Creek Road	27006004801	By Agreement entered into on 8/19/93: Owner agreed to no use of well water and no excavation below a depth of 20 feet. By Amendment entered into on 5/5/94: Owner agreed to no excavation below 12 feet.

Big D Campground Deed Restriction Summary

Signatory to Deed Restriction	Current Property Owner	Address	Parcel ID #	Deed Restriction Summary
Miller, Fred	Miller, Fred	3567 Creek Road	270110002303	By Agreement entered into on 7/8/93: Owner agreed to no use of well water and no excavation below a depth of 20 feet.. By Amendment entered into on 2/22/95: Owner agreed to no excavation below 4 feet.
Rodebaugh, Joseph & Glenna	Rodebaugh, Joseph & Glenna	3691 Creek Road	270060004600	By Agreement entered into on 7/29/94: Owner agreed to no use of well water and no excavation below a depth of 10 feet.
Reed, Ruth Ann	Patterson, Sarah	3641 Creek Road	270060004100	By Agreement entered into on 10/4/93: Owner agreed to no use of well water and no excavation below a depth of 2 feet in the easement area and 20 feet elsewhere. By Amendment entered into on 5/7/94: Owner agreed to no excavation below 2 feet in the easement area and 10 feet elsewhere.
Rodebaugh, Joseph & Glenna (Owners) and Au, Dexter and Jennifer (purchasers under a land contract)	Au, Dexter L. & Jennifer J.	3701 Creek Road	270060004601	By Agreement entered into on 7/29/94: Owner agreed to no excavation below a depth of 10 feet and no use of well water.
Sowry, Lorren M. & Carol L.	Sowry, Lorren M. & Carol L.	3783 Creek Road	270070001500	By Agreement entered into on 7/26/93: Owner agreed to no excavation below a depth of 20 feet and no use of well water.

Big D Campground Deed Restriction Summary

Signatory to Deed Restriction	Current Property Owner	Address	Parcel ID #	Deed Restriction Summary
Sowry, Gary	Sowry, Gary	3741 Creek Road	270070001202	By Agreement entered into on 8/9/93: Owner agreed to no use of well water and no excavation below a depth of 2 feet in the easement area and 20 feet elsewhere. By Amendment entered into on 5/7/94: Owner agreed to no excavation below 2 feet in the easement area and 15 feet elsewhere.
Spice, Bernice F.	Abbey, Mary & Walker, Charles	3640 Creek Road	270060005000	By Agreement entered into on 8/30/93: Owner agreed to no use of well water and no excavation below a depth of 20 feet. By Amendment entered into on 5/27/94: Owner agreed to no excavation below 12 feet.
Tinker, Harold A. & Virginia	Tinker, Harold A. & Virginia	3651 Creek Road	270060004200	By Agreement entered into on 8/30/93: Owner agreed to no use of well water and no excavation below a depth of 20 feet.. By Amendment entered into on 5/13/94: Owner agreed to no excavation below 12 feet.
Tscherne, Michele & Artman, Olive	Ferl, George	3671 Creek Road	270060004400	By Agreement entered into on 10/3/96: Owner agreed to no use of well water and no excavation below a depth of 12 feet.

Big D Campground Deed Restriction Summary

Signatory to Deed Restriction	Current Property Owner	Address	Parcel ID #	Deed Restriction Summary
Miller, Estate of Alma/a/k/a Jennie	Holstein, Edward J Jr & Kathleen F	3623 Creek Road	270110002399	By Agreement entered into on 10/18/93: Owner agreed to no use of well water and no excavation below 2 feet in the easement area and 20 feet elsewhere. Olin agreed to insure and indemnify its work.
	Nelson, Thomas	Vacant land north of Creek Road	270110002202 270110002301	By Agreement entered into on 9/22/05: Owner agrees to mine or conduct other activities on the property only from the surface to the first clay layer and agrees not to penetrate the clay layer until Owner is notified by Olin or USEPA that the contamination existent below the first clay layer has been removed and that the property may be mined thereafter, which may occur first. Owner shall be prohibited and shall prevent other from the installation or use of water wells on the property until Olin or USEPA to do so. Owner agrees to allow existing monitoring wells to remain on the property until Olin or USEPA have indicated their written approval to do so.

Big D Campground Deed Restriction Summary

Signatory to Deed Restriction	Current Property Owner	Address	Parcel ID #	Deed Restriction Summary
Vines, Arlan M. & Connie A.	Francis, James S. Lorie A	3749 Creek Road	270070001201	By Agreement entered into on 8/9/93: Owner agreed to no use of well water and no excavation below a depth of 2 feet in the easement area and 20 feet elsewhere. In a 5/17/94 Amendment to the Vines Agreement: Owner agreed to no excavation below 2 feet in the easement area and no excavation below 15 feet elsewhere.
Rodebaugh, Joesph & Glenna	Rodebaugh, Joesph & Glenna	Vacant land	270070001200	Owner agreed to: Within 250 feet of Creek Road, no extraction of groundwater and no excavation below a depth of 13 feet. Between 250 feet and 1000 feet of Creek Road, no extraction of groundwater and no excavation below a depth of 10 feet. Beyond 1000 feet of Creek Road, no restrictions
Olin Corporation		Vacant land north of Creek Road – area with gated access	27007001203	Owner agreed to: Within 250 feet of Creek Road, no extraction of groundwater and no excavation below a depth of 13 feet. Between 250 feet and 1000 feet of Creek Road, no extraction of groundwater and no excavation below a depth of 10 feet.. Beyond 1000 feet of Creek Road, no restrictions

Big D Campground Deed Restriction Summary

Signatory to Deed Restriction	Current Property Owner	Address	Parcel ID #	Deed Restriction Summary
Andrew Dreslinski (Big D Campground) – Parcel 2 (Old Campground) Olin Corporation – Big D Campground -Parcel I Treatment Plant and former disposal area	Andrew Dreslinski (Big D Campground) – Parcel 2 Olin Corporation – Big D Campground -Parcel I	3700 Creek Road	270060004803 270060004800	Olin shall have full and unrestricted access to the property for the purpose of conducting all required remedial activities by the Administrative Order or CERCLA. Owner shall be prohibited and shall prevent others form making any changes to surface contours which might affect the existing surface water drainage. Owner shall be prohibited and shall prevent others from conducting any activities that will interfere with Olin's obligations to perform its remedial activities. Owner shall be prohibited and shall prevent other from the drilling of wells or the extraction of groundwater. Owner shall be prohibited and shall prevent others from any excavation on the former Olin project site (Parcel I). Owner shall be prohibited and shall prevent others from any excavation on the Exclusion Area at the Northwest corner of the property. Owner shall be prohibited and shall prevent others from any excavating below a depth of 12 feet on the remainder of Parcel II, except that there shall be no limit on excavating on the property south of Conneaut Creek. Commercial development or residential development on the property North of Conneaut Creek is prohibited. Owner of

Big D Campground Deed Restriction Summary

				Parcel II may construct for his personal use a residential dwelling at the area of highest elevation along Creek Road. Existing fences on Parcel I are to be maintained by the Owner as is in order to restrict the presence of anyone not involves in administering the Administrative Order or CERCLA remedy. Owner shall be prohibited and prevent other from erecting any building or structure unless approve by Olin or USEPA as a necessary component of the Administrative Order or CERCLA remedy.

- All property owners are on city water
- Existing groundwater wells within the plume were abandoned.
- Reference, Records of the County Record of Ashtabula County, State of Ohio
- All deed restrictions are stamped and dated by the Records of the County Record of Ashtabula County, State of Ohio; and have been verified as to being in force today, and will continue to be in force should the property transfer.